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[Special Editorial Correspondence, by Telegraph.]

THE TWELFTH ANNUAL MEETING OF THE OHIO GAS LIGHT ASSOCIATION.

CINCINNATI, O., March 19th, 1896.

Dear JOURNAL: Before going to sleep, although the hour is very early, I avail myself of the opportunity to forward you a budget about the first day's sessions of the 12th meeting of the Ohio Association, which were satisfactorily concluded, so far as the technical and outing features were concerned, save for the weather conditions—and those conditions were of the March order in every mean sense. To begin with, Wednesday morning was ushered in with bright sunshine, but later came clouds and raw airs, which terminated in a miserable drive of rain and snow, the visit to the new retort house of the Cincinnati Gas Light and Coke Company having been made in a downpour that would have done credit (or discredit) to the southeastern shore of Long Island when in its stormiest period. Discomforts, however, were not experienced in the Grand Hotel, for everything there was of satisfying nature. The meeting room was well up to the purposes of the sessions, for one could see and be seen, hear and be heard. A feature of the room was the illumination thereof, which was beautifully lighted by means of Welsbach burners, effectively grouped and disposed. The attendance was excellent, perhaps 70 having the courage of their convictions to the point of assisting personally in the Ohio's 12th annual tryst. Amongst the visitors were Mr. F. E. Barker, the clever Chairman of the Massachusetts Board of Gas and Electric Light Commissioners; Mr. C. J. R. Humphreys, President of the American Gas Light Association; Mr. Jas. W. Dunbar, Secretary and Treasurer of the Western Gas Association; and Mr. J. D. Thompson, the "Wrinkle" Editor of the Western. President Gwynn, assisted by Secretary and Treasurer Lathrop, soon and smoothly disposed of the preliminary business, the presentation of which disclosed nothing of a revolutionary nature, after which the Association settled down to listen to the President's address, which was read by Secretary Lathrop, Mr. Gwynn's voice being out of tune from a remnant of a cold that fortunately is virtually conquered. Mr. Gwynn's address had much to commend it, for it was comprehensive, without a sign of rambling, and advisory, without a taint of egotism. It is notable, though, for the pride that permeates every Ohio man, since he desired to impress upon the members "a hearty co-operation of all * * * in the advancement of our own Association in a scientific, social and influential manner, both State and locally." Which, of course, is all right and proper. The strong point in his paper is the reference to legislation and taxation, and inferentially, blackmail, which matters concern the gas interests of every State in the Union. In fact, if I may make bold to so say, your own State of New York, so far as its gas interests are concerned, is peculiarly interested in legislation just now; for, if I mistake not, some of your Senators and Assemblymen are seeking to "adjust" gas prices at lower figures, each "adjuster" laying claim to the right to say what the price in his particular district shall be. Mr. Gwynn's mention of calcic carbide will not be greatly relished by the speculators who have been pushing it; and I presume the JOURNAL will agree to his statement that "There is very little, if any, danger to be apprehended

by the gas fraternity from acetylene gas in the near future." President Gwynn's allusions to the losses sustained by the Association through death during the year were tempered by the loss that came to his Company and himself in the decease of the Hon. Robt. Sherrard, who had for years capably conducted the affairs of the Steubenville Gas and Electric Company. The address will commend itself to those who had not the good fortune to hear it read, as a practical, safe and thoughtful paper. The paper list, as per the official programme distributed, was closely followed, save that when a question or more in the question box that related to the subject in hand could be discussed it was brought forward for discussion at the time appropriate—a practice that was productive of good results. I know that your space precludes me from off-hand comment on the papers, so I will merely say that Mr. Jenkins' "Dots and Dashes" had plenty of dynamic force, and that Mr. Light's remarks on the extension of mains into new territory were quite to the point. The technical proceedings of the first day having been adjourned, the members and guests put themselves under the care of the Cincinnati Gas Light and Coke Company, and, despite horrible atmospheric conditions, we speedily were looking upon and going through as fine an example of retort house construction as this country affords. No detail of modern practice escaped the attention of the owners and builders, and the complete result would seem to bear out the prediction made by Mr. Walter R. Addicks, of Boston, before the last meeting of the New England Association of Gas Engineers, that gas made from coal, even if cannel coal had to be called upon once again, seemed to be growing in favor. Never mind, though, whether gas is the result of cupola practice, or whether it results from the baking of coal by the inclosed practice of yesterday and to-day, the fact remains that the Cincinnati Company can and does make gas cheaply, satisfactorily and profitably, and that its new house is not only just up to the point of meeting its own wants, but of showing to some others of the Western Companies what they might and what they should do to better themselves. Following the inspection of the Cincinnati Company's house, where an excellent luncheon was spread and absorbed, came the participation in the theatrical party for the Walnut street Theater, where "Fair Virginia" was on show. The "fair West" should not be asked to contribute too much towards fair shows that long ago have been condemned in the East as unfair to the South; and so let me conclude by saying now what I should have said before, that, even if the play dragged a bit, the Association kept pace with its records by electing General Hickenlooper to Honorary Membership—merely the act of crowning a king who always reigned. The members added to the rolls numbered 15.—S.

CINCINNATI, O., March 20th, 1896.

Dear JOURNAL: The weather of yesterday (Thursday) was simply horrible; a driving, damp snow storm did one thing, however, which was to cause the delegates to keep pretty close to the meeting room. The executive session, which opened the second day's proceedings, lasted an hour and three-quarters, and I am really sorry that the discussion will not be printed. It was unrestrained and full of interest, and I think it likely that the Ohio innovation will be tried by every other Gas Association in this country. The Association voted to indorse the suggestions of President Gwynn respecting the close watching of legislation affecting Ohio's gas interests, and Messrs. Jos. Gwynn, C. H. Welch and J. W. R. Cline were appointed an "Advisory Committee on Legislation." The officers elected were:

President—Jerome Penn, Washington Court House.
Vice-President—W. C. Boyle, Salem.
Secretary and Treasurer—A. P. Lathrop, Columbus.

The next place of meeting is Cleveland. The weather was, of course, decidedly unfavorable for the outing; but a parlor-car excursion was made over the circuit of Covington and Newport, the gas works being inspected as per the programme. I need not say that "Ed." H. Jenkins was very much (and pleasantly so) in evidence. The proposed visit to Fort Thomas was not made. The total increase in membership is 18. In all respects the meeting was an unqualified success.—S.

NOTES.—Mr. Walter P. Elliott has been appointed Superintendent of Distribution by the Hartford City Gas Light Company.——The Newark (N. J.) Gas Company has purchased a site for an office building at the junction of Broad street and Central avenue. The plot is 50 feet by 100 feet, and the building will be constructed in accordance with the best building practice of the day.——The Atlantic City (N. J.) Council has refused to grant an opposition gas franchise for that place.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—CONCLUDED FROM PAGE 413.]

TWENTY-SIXTH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., Feb. 20 and 21, 1896.

SECOND DAY—MORNING SESSION.

The President then introduced Mr. Fred. H. Shelton, of Philadelphia, Pa., who read the following paper entitled

SHOULD GASHOLDERS IN NEW ENGLAND BE HOUSED OR NOT?

As a result of joining this Association I am "held-up" by your ever alert Secretary for a paper at the first meeting afterward. I presume this is your usual process of initiating a new member! If, however, you are expecting to have some fun with me by making me read a paper (with the conclusions of which you will not probably agree), let me square myself in advance, so to speak, by a little quiet fun in pointing out herein some of the beautiful inconsistencies in gasholder practice among the members of this Association. And if I am thus able to extract a little humor from the situation, let it atone for whatever of dryness may also be found.

I have been led to investigate this subject by noticing that many New England gas managers, in adding a holder to their works, seem to feel that a house around it is essential, and including it they incur very considerable additional expense; while many other managers seem to equally feel that a house is *not* necessary, and by omitting it they save that expense. This state of affairs is somewhat curious, for upon most other questions of necessary or desirable gas works equipment I think New England gas men may be said to be in very general accord. That on this question you are *not* in accord is shown by the following:

In comparatively recent times new gasholders have been put in at New Britain, Northampton, Burlington, Chicopee, Lynn, Gloucester, Nantucket, and other places, all with houses around them. In the same period an equal number of points—Waterbury, Danbury, New Haven, Woonsocket, Malden, Framingham, Newton and other places—have put in holders *without* houses. All of these places are scattered on the coast and in shore; are north and south; are large and small. Why did one do one thing and one another?

Again; along shore you often say, "We get pretty high winds here, and we wouldn't have a holder unhoused." And so along shore we find Norwalk, Warren, Ipswich, Beverly, Salem, Gloucester, Portsmouth and other salt water towns consistently with housed holders. But, on the other hand, we find Stamford, New London, Westerly, Fall River, Amesbury, Cottage City, Portland and other such New England clam centers all with *unhoused* holders, apparently transacting business in all serenity nevertheless; and New Haven, Bridgeport, New Bedford, Lynn and others straddling the question by having both housed and unhoused holders. In New Bedford, on the coast, the principal holder is housed; in Fall River, a few miles away, under precisely the same climatic conditions, not one of the four holders of the old Company is housed; and (showing the beautiful contradictory practice referred to), yet again we find the other, or Manufacturers' Company, in that city, *with* its holders housed. And if we go out to sea, in Nantucket and Cottage City (where the winds are so high that the chickens, it is said, frequently go naked owing to inability to retain their feathers during gales), we find that the former place has a housed holder, while the latter's is unhoused. Last year Burlington, which is farther north than Toronto, Canada, put in a housed holder, while a moderately recent 30,000-foot one, at Lewiston, was not housed; nor was a new one at Laconia, nor two new ones at Keene; and St. Johnsbury designates the extra expense of housing as "money thrown away." We find Jamaica Plain with a housed holder, and a new unhoused one of a similar size comparatively side by side. Innumerable such instances are familiar to you, until verily the gas man who happens to turn to the practice of his neighbors wonders "where he is at."

The matter so far seems to have been determined by the individual opinion of the man adding the holder. It seems to me that the question (which, certainly, upon the score of expense, is an important one), ought to be better determined than it is, and that such a paper as this, the first, as far as I know, before any Association upon the subject, may draw out the facts and experience and general opinion of the New England gas men at large upon the question, which facts and consensus of views may be made available and considered hereafter in addition to the personal opinion of the man putting in the holder.

I sent out a circular, as most of you know, to all the New England Gas Companies, in an endeavor to round up some opinions. I received replies from almost exactly half; and right here, to those who kindly replied, I express my appreciative thanks. I regret that I did not get replies from all, so that the figures in this paper might be complete. I presume some officers of companies were personally so busy shovelling snow off the crowns of their unhoused holders that they couldn't get around to it!

Taking the replies that I received, from practically every other one of all the Companies in New England, and assuming that the 50 per cent. answering fairly represents the condition of the other half, and, doubling to find the totals, here are some holder figures.

There are at this date in New England (exclusive of gas plants for mills and institutions) about 136 Gas Companies having about 350 holders, an average roughly of 2½ holders to each Company. Thirty-four, or only 25 per cent. of the Companies, are in Maine, New Hampshire and Vermont (the upper and colder half of New England), leaving 75 per cent., or 102 Companies, in Massachusetts, Rhode Island and Connecticut, the warmer half. The smallest holders in use are about 4,000 cubic feet capacity. The largest holder is about 1,500,000 cubic feet capacity. One-half are "small" holders—say of 40,000 feet or under; about one-quarter are between 40,000 and 150,000 cubic feet; one-tenth (35) are between 100,000 and 150,000 feet; about one seventh are large holders—*i. e.*, 200,000 and over; about one-tenth (35) are 10,000 feet or under in size.

About three-fourths of all the holders in New England are housed; about one-fourth are not. About 60 per cent. of those replying believed in housing holders; about 20 per cent. flatly didn't; and about 20 per cent. were blessed if they knew which they'd do.

From the dates that I secured, of the time of erection of the various holders written about, it is evident (as is in fact well understood) that the earlier and general practice in the section was to put in housed holders. That easily occounts for the preponderance of such in actual numbers to-day. It is also evident, however, from the dates that that general practice has changed; for in the past ten years about as many unhoused holders have been built as housed—although, so far, numerically speaking, the unhoused holders haven't had time to catch up in the total showing against so many housed holders built before them.

The present practice may be said to be quite evenly divided. The question is, "Which is right?" I do not pretend to say that a hard and cast iron rule answers the question—that all holders ought to be housed, or that holders need never be housed. It obviously depends a good deal upon the size, the location and surrounding conditions. I have, however, after having had personal experience with both kinds in the winter, in Maine, after having given considerable thought to the matter, and after having discussed it largely with others and digested the answers to my circular letter of inquiry, reached a state of fairly definite personal opinion upon the subject, contrasted with (I am free to say) a previous state of large uncertainty. It is impossible, in the limits of this paper, to give the detail of all that has led to my conclusions or of the prolific, partisan, pronounced and even profane opinions offered me. If I did, I probably would still not convert those whose opinions are already fixed one way or the other. However, to those who, like myself, have been or are now in a state of doubt, perhaps my conclusions and reasons below may be helpful.

I decidedly believe that large holders, say of 300,000 feet and upwards, should not be housed, as in fact they now rarely are. The enormous cost is allowed practically to prohibit it.

Very small holders, say of 20,000 feet and less, I believe may often be advantageously housed, although not always necessary. I believe that, as a rule, it is *unnecessary and inadvisable* (the benefits being incommensurate with the expense involved) to house four-fifths of the holders erected, or the great run of medium size holders, not even if such holders are outlying ones, although it may then be sometimes more expedient. Geographical location to my mind has but little to do with it one way or the other. I have already pointed out the variability in practice right here in New England, and, as far as final facts go, whether along shore or up north in the colder portions, the companies without housed vessels seem to operate as successfully and to pay as good dividends as those with. Bearing on this point, it might be noted that the companies west, through Michigan, Wisconsin, Minnesota and the Dakotas, where the temperature is as cold and snow as great as in New England, are by no means as given to housed holders as are those in this section. Nor are houses universal in Canada. New England is not addicted to more furious blows than are to be found in Dakota blizzards, Kansas cyclones and Southern gales and hurricanes, in which named sections holders are not usually housed. Climatically, from snow, colds or wind storms, New England has no more to contend with than other localities operating generally on unhoused holders. The question is something else than, and is but little dependent upon your particular geographical location. It really is, "*Is the expense justified in any location?*" The expense is something enormous for large holders. Consider the huge houses of the Boston and adjacent companies, and those at Lowell, Springfield, Worcester, Providence, New Haven, etc. In smaller companies the expense is a lesser sum, but still in proportion. It varies, of course. I have heard of the extra cost being as low as 16 per cent., and also where the cost was double; but, as a rule, it adds from 35 to 50 per cent. of the combined cost of the holder and tank—in themselves the most expensive items in a gas works. To-day (what with opposition companies, "strikes," municipal and legislative interference, the tendency to municipal control, the development of natural competitors, etc.) the exigencies of the business are such that extensions are not so generally made from earnings as before, and I believe that it is less desirable to lock up money in the business (in large holder houses for instance) at least as freely as was done 20 years ago. With small companies a new holder frequently means the suspension of dividends for a time; a house included in such a case means for a 50 per cent. longer time. Take, for instance, the large proportionate cost, to total plant, of the fine but expensive slate roofed brick house at Greenfield, a small interior State town of slow growth and small possible volume of business. The capital locked up in a holder house is that much more upon which to earn dividends and that much more for the tax assessors' ever ready shaft. With taxes now in Massachusetts amounting generally to from 5 to 20 cents, and even as high as 34 cents for every 1,000 feet of gas sold, it is no joke to increase one's taxable property in such a visible manner, unless an adequate earning power is in return secured, which is not, to my mind, the case in most instances. For those works that insure, the extra insurance is also an item.

Of course, as a whole, with an equal degree of care, and outside of cost, nobody denies that a holder house in itself is a good thing. The entire question hinges on whether the extra expense is *justified*. The advocates of holder houses say that it is, for a variety of reasons. Here are all I've ever heard of:

First, "the holder lasts longer." In my circular I asked, "How much, in your belief, does housing a holder add to its life?" That it is at least an undetermined period I shall prove by the replies. A few said it made but little difference; one figured it at 10 to 12 per cent.; others went that better and made it 25 per cent.; a few concluded that 33⅓ per cent. was the right figure; one added 6⅔ per cent. to that, making it 40 per cent.; some said 50 per cent.; some were quite sure that a house "doubled" the life of a holder; one man raised the ante by saying that it was as 3 to 1; while a highly respected member of your Association concluded that it added "indefinitely" to the life; despite that he wrote me he was undecided whether to house or not! One other, I should have said, declared that a holder house would outlast a dozen holders, which, at only 25 years each, would make holder *houses* last 300 years. But, jesting aside, while there is a general belief that housing adds to the life, it is by no means proven or universally believed. The chief engineer of one of the largest holder construction firms in the country writes me that, with proper care, he "does not think that the life of a holder is decreased by not surrounding it with a building." One other holder firm of high repute in New England expresses the blunt belief that an *un*housed holder will often last the longer, for the reason that housed holders are more apt to be left to take care of themselves, and are apt to be less frequently and not so carefully examined, scraped and painted, owing to the light inside the houses being as a rule much less bright than the clear daylight of an open holder; also, for the reason that, under certain atmospheric conditions, a housed holder will sweat and remain damp longer than an open holder, which dampness increases the liability to rust and makes it desirable to paint such a holder, to counteract this point, quite as often as an open one. Also, that because a holder is housed a lighter weight iron sheeting is supposed, in some cases, to be adequate, thus neutralizing somewhat at the start the advantage of a house as to life of the holder within. Still another erecting firm doubts if housing a holder materially adds to its life, believing that "there is not much difference, if kept well painted."

One of your oldest members, who for years has had two unhoused 200,000 foot double lift holders in his care, well to the north, and has only lately renewed one section after 33 years' use, believes that his holders will last longer than housed ones. We do know that holders in the open often last 25, 30 and 35 years. Do housed ones last longer? *It seems to me that the degree of care given them is the most pertinent factor towards long life, not the housing.*

The point has been made that, in some open holders, a fine pitting or pinhole corrosion has been noticed on the side receiving the sun, and on the crown, which parts, owing to greater expansion and contraction, gave out earlier than the portion of the plating in the shade—the contention being that a holder housed and entirely in the shade would have less of any such action. It seems to me that this point, while of interest, and important, if demonstrated, is yet too infrequently occurring, or believed in, or argued upon, to be conclusive, and that the point, together with "the more rapid corrosion of holders in salt air" (claimed by one), is controllable by proper care and painting.

It is claimed that housed holders are safer from high winds and wrecking than unhoused. This may have been so in the early days, when a holder, 80 or 100 feet in diameter, had but three guides (I have seen such a one in Pittsburgh); but against the modern and better designs it is no adequate point I think. There are too many modern exposed, unhoused holders that have stood nobly under exceptional blows and gales to allow it to be said that housing is necessary for practical safety.

Illustrating the tendency of better design and construction than in the past in this respect, let me say that an ordinary 16 feet by 50 feet (or 30,000 feet) holder, current design, erected under my supervision at Tampa, Fla., six weeks ago, had 10 guide columns and rails with diagonal wind ties, compared with the 5 or 6 only of common, older designs. I think it may be safely asserted that most wrecked holders (extremely rare occurrences at best) have occurred, not because of lack of housing, but because of original faulty design, original lack of strength, or of faulty adjustment—all of which points need not and should not exist in new holders of the present day.

Danger in case of fire or explosion is claimed as an advantage in holder houses. If it is a minor fire or explosion, and external, I quite agree. If it is a large conflagration, the falling of timbers from a blazing holder house roof would do damage not found (even with a lowered holder) with an open holder with iron guide framing only, that would not burn. In the event of internal explosion, rare but not unknown, the house goes too, as well as the holder, involving enormous wreck. Witness the 250,000-foot Montreal house and holder that exploded a few years ago, and the case at Biddeford a couple of years ago, etc.

It is properly said that a housed holder, locked up, cuts off interlopers, prevents all interference with it, and is not "a receptacle for the neighborhood." Very true; but is the point an important one balanced against what one pays for this convenience? If there was much danger or real trouble from children or other stray articles slipping into holder tanks, we would have railings around the tank coping. The rarity of such easy remedy shows the trifling troubles we have. As to stones, the broken glass, etc., of a holder house is quite equal to the trouble caused from small missiles against an unhoused holder. As a matter of fact, few people trouble a holder at a works. I *have* known of a lean horse slipping into the tank, and foul gas on the town for weeks afterward that drove the manager to despair because of clean purifier tests. A house would have prevented that!

The more even temperature of the gas in a housed holder, and consequent less "leakage," or "shock," or loss of candle power, is a reason I have in one instance had urged in favor of houses. It is not a reason that has been demonstrated. It has not been shown that companies with open holders have less candle power across town in severe weather than companies with housed holders. As a matter of fact, gas ultimately reaches the low temperature of the street mains, and whether it drops down to atmospheric or freezing temperature in the mains, after leaving a housed holder, or in an unhoused holder before entering the mains, would seem to me to make but little practical difference. Nor do I think gas especially "shocked" by its entrance into the large body of gas in an open holder, even if that body of gas be much cooler than the entering gas.

As to the general claims of comparative freedom from "care and worry" and "gray hairs" on the part of the superintendent, I have only to say that it is no doubt true, as a broad abstract proposition, and especially as applied to some holders now existing, but that I believe that, with new holders of proper weight and design, the care of them, even if unhoused, involves no such strain upon the manager as to make it a vital point toward incurring the expense of a house around it.

A lesser expense for heating, removing snow and ice, general (but very indefinite) "repairs," painting and attention is probably the most popular argument for housing holders. Let us see how it shows up, at least from figures at my command. About 35 answers to my questions as to relative expense were explicit enough to judge from. The cost of caring for a housed holder, while by some expressed as "nothing," or so little as to be "trifling," ran from $5 to $50 per year. The average was $22.50. The cost of caring for an unhoused holder ran from $5 to $125. The average was about $40, or, say, twice the cost of caring for a housed holder, as is generally felt to be the case. But I also was curious enough to inquire about the cost of caring for a holder house. The expense for this was put variously at from $5 to $50 per year for painting, new shingles or slate, broken glass, locks, window sashes, etc. The average was $20, and this, added to the apparent average cost of steam and paint and hose and labor above mentioned, for caring for the holder within, makes the total average cost quite as much as that of caring for an exposed holder only.

The above figures are for the great run of holders of 100,000 cubic feet, and less, in size; for not very large holders or for outlying holders. In the great majority of works no extra labor is hired to attend to the holders. Steam is usually very cheap in a gas works, either with coke for coal gas, or with the larger boiler equipment of water gas works. Is the expense of maintenance very much in any event? The above figures are what a good portion of the New England men believe it to be. A small company may pay out $50 a year extra for caring for an unhoused holder. Say a suitable house would cost $4,000. The interest on this is $240 a year—five times the cost of caring for the open holder and 1 per cent. on $24,000 of its capital. Again, a holder house in a fair size works costs, say, $15,000; 6 per cent. interest on this is $900 a year. Does anyone pretend that the labor and steam cost that? One man can be hired for a year for half that, to sit on a stool and watch it. As a matter of fact probably a few periods only in three or four months comprise all the time wherein it needs special attention. If it were an outlying holder the proposition is different. It is then a question of extra steam plant and labor vs. interest on cost of house.

As to the weight of snow wrecking a holder, I believe, on modern holders with fair attention, the risk to be very slight. And that a simple device of steam pipe could be provided upon the crown of a holder that could be put into use only during severe snow storms that would prevent uneven accumulation. I have heard the suggestion of a double crown for that purpose, forming with steam between the heads a warm head. As to ice in cups, and around the tank, of course, that is something that has to be looked after, but not greatly more than if a holder is housed. We have to pay too much, to my mind, in housing a holder to make it pay, if we simply gain in return a slightly lesser degree of attention.

A good steam hose rigged on a counter-balanced "Cutler" wheel and a few internal overflows will take care of ice with a reasonable degree of assurance.

As to the question of less frequent painting required, the net amount saved is very small, comparing again with the expense of a house. As a matter of fact, I think a holder that is housed ought to be painted very nearly as often as one that is unhoused, and some companies find such necessary or desirable in practice. The saving is not 100 per cent. of the painting bill. It is only part of the cost of painting, which is but a moderate item and occurring at intervals only.

"It cannot be denied," writes one man, "that the most contented and complacent New England superintendent, especially at this season of the year, is the one who has his holders housed. The wind may blow great guns, with the thermometer below zero and the snow be piling up, with the prospect that he may have to dig himself out in the morning; but he is unconcerned and gently sleeps on, while the superintendent of a neighboring works tosses uneasily on his bed and imagines the most direful calamities to his unhoused holders."

All this may be very true, but, in spite of all the arguments, the sentiments, the conveniences and the economies effected and argued for, I yet cannot reach any other conclusion than that I believe tradition and habit are largely responsible for unnecessary expense for housing holders in this section. I believe that the general housing of holders is a luxury involving an expense incommensurate with the returns thereon. I believe that the interest on the extra capital invested usually considerably exceeds the cost of maintenance of unhoused holders, and that the æstheticism of the lesser operating expense and better dividend checks is higher art than the perspective of ivy covered walls of a holder house.

I believe that, with modern well built holders, operated with a fair degree of supervision and care, no special apprehension need be felt as to their safety, nor special trouble be experienced in operation because of their being unhoused.

This applies especially to holders located at the works where they are comparatively easily cared for. I believe that in the cases of some outlying holders housing pays, though not always, because any outlying

holder in winter needs attention, and if you have to have an attendant he can take care of an unhoused holder often at as little cost as a housed one. In the case of quite small companies, having only one man at the works, or where no night work is done, it may be best to house, as in this case the stored up heat in a housed holder would probably carry over 'til morning (avoiding the expense of a night man for attending the holder only), where an unhoused holder would not permit of such arrangement.

In closing, let me add a few disconnected items pertinent to the subject that may interest those contemplating a new holder.

The best lighted holder house I ever saw is in Detroit, Mich. There are no windows in the walls, but in the roof, near its base, a continuous skylight of glass, some 3 feet wide, is substituted for a few rows of slate, and lets a surprising amount of light in on the crown and down the sides into the annular space between the holder and the brick walls. The arrangement is worth copying.

The most southern housed holder that I know of is in Dayton, Ohio, which is about as far south as Wilmington, Del. Does anyone know of a housed holder below this latitude? The brick tank walls in this holder rack out and carry the house walls, thus avoiding extra foundations.

In Ithaca, N. Y., the steel tank, above ground, of a double-lift holder is protected by a wooden house built around the steel tank only, giving an annular air space readily heated.

In New London, Conn., an ordinary small holder in a banked up brick tank is warmed by a small tunnel encircling the holder within the bank, in which tunnel a small coke fire is maintained. It is said to be effective and easily handled.

In Buffalo, and probably in some other places, there is a holder encased with corrugated iron attached to the guide framing, thus forming a housing cheaper than brick. A second one is now going in, arguing well for the experience with the first.

With brick tanks and a holder about 100 feet diameter by 60 feet high, this scheme is said to add about 45 per cent. to the holder cost; with a steel tank and holder, about 30 per cent. to the cost of such. In 1886 such arrangement was put in at St. Paul, Minn. The experience there has been that it is a complete protection against snow, and but little protection against cold or ice. The repairs for rust-bitten and blown-off sheets have been quite as much as the repairs on an unhoused outlying holder in the same city.

In Rockland, Maine, my impression is that two moderate size, unhoused holders, situated in an exposed location, are partially protected by a simple wooden screen built to windward.

Two of the members of this Association, in replying to my circular, expressed the thought that if they could have one holder housed they would waive housing additional ones, taking chances on being able to get along with one holder (the housed one) if aught happened to the unhoused ones.

Another member said, rather than house a holder, at the works at least, he would put the extra money into a bigger holder.

Another said, "Avoid a tin roof on a holder house." I found five kinds of roof—slate, shingle, tin, gravel, and canvas.

Another said, "A cheap house is worse than none at all."

Most of those advocating housing were those who had houses, and some frankly admitted that they had had no experience with unhoused ones. Two of those having housed holders, yet were against housing holders. One man looks upon the interest upon the cost of a holder house as "an annual premium for accident insurance."

At Providence is perhaps the largest housed holder in New England. The dome is as large as St. Peter's in Rome, and is said to be the mark that Roger Williams steered for in sailing up Narragansett Bay. Perhaps Mr. Slater will tell us of some of the other interesting points.

Mr. Leach, of Taunton, wrote that he "would not house a 5,000,000-foot holder." Statistics as to Taunton's output are in order!

Gentlemen, I have taken up more of your time than I expected. I hope that by it I have possibly helped some of you on this question. I have benefited by studying over it. You, gentlemen, may now have some fun by disagreeing with my conclusions. If, however, any of us are helped by such disagreement I shall not mind it a particle.

Discussion.

The President—I feel more or less anxiety about allowing the discussion to commence upon a subject about which there seems to be such adverse and hostile opinion, but I have decided to risk it, with the understanding that only one man shall talk at a time.

Mr. Addicks—Mr. Shelton, what is the effect upon pressure and distribution of an unhoused holder, isolated from the works?

Mr. Shelton—I do not think you can make any generalization as to the effect upon pressure of an unhoused holder. I think it must be a question depending upon local conditions. That which would apply at one place might not apply at another.

Mr. Addicks—I refer also to the question of snow.

Mr. Shelton—I believe that it is possible by some form of steam device to prevent increase of pressure from accumulations of snow; and that, even if not possible, the expense of taking off snow is comparatively moderate.

Mr. Addicks—In other words, if you run an independent main from the gas works direct to the holder, and have a governor at the outlet of the unhoused holder, the result is the same as if the holder were housed?

Mr. Shelton—Yes.

Mr. Allyn—I would like to hear from our Secretary. At the time he contemplated building his last holder he and I had quite an animated discussion as to the comparative benefits and advantages of housed and unhoused holders. He finally seemed to think that my opinion was not quite sound, for he covered his holder.

Mr. Prichard—Some years ago we had a holder which was built on wrong principles. It had a heavy, trussed frame, with an almost spherical roof, and as this top contained about all of this heavy frame, it was topheavy; and one February morning the thing blew over, leaving my 300,000 business dependent on a 100,000 holder. The effect of that catastrophe was to make me for a while over anxious about the construction of the new holder. We covered the holder by erecting a building on the tank wall, thus saving on foundations, and disposed of all guide framing by carrying the holder on railroad irons built into the wall. So the extra expense was not so much as might be thought. We find that, in the matter of care, it reduces our expense per year about 50 per cent. I do not think it would pay to house all the holders, but I do think that, situated as we are, and exposed to very high winds, there is an additional feeling of security in having one of the holders housed. I would not house another holder, but having one holder housed I feel comparatively easy under almost any circumstances.

The President—We have with us one member who represents a concern which is building holders all over the country—Mr. Corbett—and we shall be glad to hear from him.

Mr. Corbett—I would prefer to be a listener.

The President—That may be so, but we would also like some remarks.

Mr. Corbett—The subject has been so well treated by Mr. Shelton that very little is left for me to say.

The President—I am inclined to think that if any of us wanted a holder built you would talk very readily, but now you have an opportunity to talk to us all together.

Mr. Corbett—That is very true, and for that reason I prefer to be very modest.

Mr. McDonald—Some gentlemen seem to think that if they house the holder they have made it very safe; but one of the best holders I ever knew—and a housed holder also—happened to be in the path of a cyclone which lifted the house, dropped it down on the holder and smashed the whole structure.

Mr. Prichard—What would have happened to the holder if the house had not been there?

Mr. McDonald—I don't know; but I think the iron would have stayed there if properly bolted.

Mr. Bush—As regards the comparative life of the two styles of holders, not only is there a liability to the sheets sweating under certain climatic conditions, but it seems to me that the general run of housed holders contain damp air, which also interferes with the life of the sheets. A vivid picture has been drawn of the anxious manager of an unhoused holder; but it seems to me there is also that very same possibility for the man who controls a housed holder in having some one under his charge bring a light into that house, which chance, of course, could not exist with an unhoused holder. As to the expense and trouble of shoveling off snow, perhaps Brooklyn might not be taken as a fair place to judge by, but during the past winter the cost of shoveling snow from three holders there amounted to $2.60.

Mr. Nettleton—On receiving Mr. Shelton's questions, and trying to answer them, it struck me it was very much easier to ask questions than it was to answer them; and I felt very much like frankly saying, as some of the other members did, "I don't know." Years ago (and my remarks apply simply to small works) I was certainly very strongly prejudiced in favor of housed holders, and I have two holders with houses over them. It is certainly a comfort in a stormy night, when

heavy snow is falling, to know that the snow will not get on to those holders, and to know that you do not have to turn out and find men to shovel it off. But recently when building an outlying holder, after looking into the matter quite carefully, it seemed to me to be a waste of money to put a house over the holder. We, of course, have a man there to take care of the steam and to keep the ice out of the tank and cup; and the additional cost of that labor, etc., could not begin to equal the interest and depreciation on the investment required to put up a house as compared with that of the guide framing. And since hearing Mr. Shelton's very able paper, I doubt if to-day I would put up a holder at the works with a cover over it. I wish to congratulate Mr. Shelton on his paper. It is certainly a very able one, and he has gone to very great trouble in obtaining the information. I had no idea there was so much diversity of opinion and of practice in New England as here appears to be from the statistics he has given.

The President—While this subject of the gasholder is before us, it might be well to consider the question on our circular: "What ratio should holder capacity bear to maximum output: First, with straight coal gas; second, with auxiliary water gas?" Has any gentleman anything to say about it?

Mr. Harbison—When the question as to housing holders was brought before me I replied to Mr. Shelton's letter of inquiry that, personally, I was very much in favor of housing holders, that is, theoretically speaking; but that practically I have had no experience of which I can speak, and because we have not had the room necessary to have a house for the holder. We purpose building a holder the present year, but we are as fixed in that regard as we were previously—there is a lack of room for a house. We want all the holder space we can get, and land in the vicinity of the Hartford gas works is a pretty high priced commodity. I think the question of housing a holder has several features about it that are pretty important. The wear and tear of an unhoused holder, by the changes of temperature or difference in temperature on one side as compared with the other, especially when the sun is very high, is severe. Our experience is that the south side of a holder will wear out much before the north side, because of the greater amount of contraction and expansion caused by the rays of the sun. We had some work to do last year, and have more to do this year, in the way of repairs by putting in sheets which have been worn out from that cause. I think there is a mistake in the minds of some people in regard to the expense of painting holders. It has been our custom for many years to paint with coal tar. We make a very good quality of coal tar, and so our raw material does not cost much, and we put it on quite liberally with a whitewash brush, which does the work very well indeed. It is not expensive, and it is lasting. We do not have to repaint oftener than once in four or five years. The proper care of a holder, and its protection in the winter from snow and ice, are very serious questions in our section. I think our friend from Brooklyn did not give the average cost when he said that the care of three holders in that city this winter had cost only $2.60. That may be so, but there has not been much snow this winter. If he will compare it with the same length of time a year ago he will find a difference in the cost of caring for the holder by keeping the snow off. With us we have had considerable difficulty with heavy snows. The storms frequently come in the night, and are accompanied with high winds, and the snow will drift and lodge on one side of the holder, and we are pretty sure to get into trouble if it is permitted to accumulate there. You would avoid all that by having a housed holder. The house can be so ventilated that there will be no danger of explosion by reason of taking in a light. That is a danger that can be readily guarded against. I am very greatly in favor of housing holders, and would house ours if I could. In reply to the question as to the proper ratio between holder capacity and maximum output, I would say that, in my opinion, 50 per cent. over maximum is a very good basis for storage capacity. I do not think it is safe to go with less than that. And there is more than one reason for it. You cannot give your men any time off if you have not storage capacity. Our practice, started a quarter of a century ago, is to give the men the Sabbath for rest. That would not have been done if we had not had storage capacity. We have not been able to do it this winter for the lack of storage capacity; but we do it when we can. I think it is the duty of every gas manager to keep that in mind. In running gas works there is something to be considered besides the dividend charge. That is a feature not to be lost sight of, but it is not the only consideration. In my opinion that is not the sole aim and object in chartering a gas company and carrying on the business of gas making—the amount of the dividend check that can be sent to stockholders. Give them a fair return for their investment, and then manage the business in pretty nearly a humane way, and in a way that is for the interest of the public—for they have some rights that even gas companies ought to recognize and respect. And the men that you employ are entitled to some consideration. They cannot work seven days in a week and 52 weeks in a year and do their work well and live as long as those of us who have an occasional hour off, even if we do not have it more than once a month. I believe in large storage capacity, and that better results will come in a term of years.

The President—Would any other gentleman like to talk on the main question, or on the two questions suggested by our circular?

Mr. Bush—I do not think it is a good plan to take a light into the purifying house, any more than it is to take it into the holder house.

The President—There might be some marsh gas there.

Capt. White—Of course, a paper from Mr. Shelton is always interesting; but this is especially so. Like Mr. Nettleton, I have myself been on all sides of this subject. I have built holders both ways, and have advised gas companies to build both ways. To my mind it largely comes down to the question whether the company is rich enough to spend so much money for the absolute comfort of its engineer. There is no question about the comfort of having a housed holder. If I had the money to do it with I would house my holders every time; and I have proved that by doing it wherever I have had personal control. I believe in it.

Mr. Shelton—May I say a word in ending the discussion? After Mr. Nettleton's courteous expression of his appreciation of my paper, to his further statement that he was unable to answer the questions in my circular satisfactorily to himself, I will say that in some respects the most explicit answers to my inquiries came from him. And to the Association generally (as a little in extenuation for having disagreed with the general opinion which appears to have been held upon the subject among your members), let me say that the prettiest gasholder house that I have ever seen was right here in New England. It is a little outlying holder connected with the North Attleboro works. The architect knew his business, and by putting on about 2 per cent. extra cost in the way of windows, cornices and decoration of the entrance, etc., the result was that the building looks more like a library than the gasholder houses to which we are accustomed. It proves that when you do decide for houses for your gasholders, New England men know how to make them attractive in appearance.

On motion of Capt. White, a vote of thanks was tendered to Mr. Shelton.

The President—I promised Mr. Sherman that, after all the papers had been read, we would take up the old question of naphthaline. He proposed to speak on the subject when we were discussing the question of temperature, and if he cares to talk on naphthaline we shall be very glad to listen to him.

Mr. Sherman—In my experience I have come to the conclusion that the question of temperature is the main one in regard to the formation of naphthaline. I think if we can reduce the temperature of the gas low enough as we send it out into our mains, we shall have very little trouble from its formation. About two years ago I rigged up a condenser, and used that with well water, and brought down the temperature of the gas the year round, or during the warm months of July and August, to 60°. My record during that time shows we had very little trouble with naphthaline. We removed it in this water condenser. We took out a very large quantity once a month during the warm weather. Lately we have discarded that form of condensation, and have since had more or less trouble with naphthaline; and during last season, commencing in August, we were about closed up. Our mains, services, meters and inside fittings were choked with it. We had as high as 150 complaints a day. As a remedy I propose to start in again with this water condenser, hoping to leave the naphthaline in my yard instead of sending it out into the inlets and outlets of the holders, and into the mains and services. I believe it can be done, and I believe that is the remedy for this very great annoyance in our business. In looking up the record which I sent to Mr. Gifford (and which was made by Professor Silliman), I find that a portion of it was made with special reference to what temperature had to do with the formation of naphthaline, and he came to the conclusion that it had a great deal to do with it. He, at that time, had us put up a hot scrubber—the Smith & Farmer condenser—and we spent several thousand dollars on it. At the time that seemed to help us; but we got relief and more satisfactory results from condensation, by bringing down the temperature to about 60°. Our artesian well water is 56° the year round, so that we can bring the gas down to 60° easily enough. I think the record I sent Mr. Gifford showed a variation from 47° to 72°. Along in July and August our gas would be at over 70° in our mains. If we can bring that down and start it out into our holders at 60°, I

think we shall have very little trouble with naphthaline. At least, such was my experience when we were doing that. I simply throw this out as a suggestion. I know of no other question about which we are all so at sea as we are in respect to the formation of naphthaline. That table would not hold all the papers read and published on the subject; and in one respect we know as little about it to-day as we did 25 years ago. We know that it is in some way connected with condensation and temperature, but beyond that we know very little about it.

Mr. Harbison—I would like to ask Mr. Sherman why, when he was having such satisfactory results from the use of artesian well water, and no naphthaline, he discontinued that plan and brought on the naphthaline trouble again. Why did he not continue the use of the artesian well water, and so avoid the trouble he is now laboring under?

Mr. Sherman—We outgrew the apparatus. The condensers becoming too small, we replaced them by the usual multitubular condensers.

Mr. Harbison—You could still use the artesian well water?

Mr. Sherman—We do use the artesian well water in the multitubular condenser; but that was *before* the gas enter the purifiers. What we now propose doing is to put in artesian well water condensers *after* the gas leaves the purifiers. There is a certain rise in temperature after the gas passes through the purifiers.

Mr. Taber—Some years ago, one cold morning I happened to let a little of the benzine vapors and oily vapors come right out against the cold water and in the chilly air, and the formation of naphthaline was immense and instantaneous. Since then I have always believed in the theory of that French chemist (M. Bremond) who said that naphthaline was formed by the sudden shock of hot gas against cold water. That is the way it formed at the end of the outlet from the tar still that morning. Is not that perhaps the best remedy in the case of Mr. Sherman's?

Mr. Nettleton—I know our President has devoted a good deal of attention to this matter, and has prepared charts showing the relations between the formation of naphthaline in the services and the temperature of the services and the outside air. I think he can give us a good deal of light on this perplexing subject.

The President—I am utterly unprepared to say anything on the subject. I suppose we are all more or less interested in this question of what happens in the fall months which causes this trouble in the services—the trouble being universal throughout the States. Two years ago the trouble seemed to be very general indeed. Almost all the companies experienced it, and some of them had very serious trouble. It did not seem to matter whether a company was sending out plain coal gas, or plain water gas, or a mixed gas; for the same trouble occurred with all. I am interested in this subject because we want relief from this trouble in the coming year and in the years that follow. I am also interested in it as I am in any problem which I am unable to solve, and I shall continue to be interested in it so long as we have the thing before us—the formation of naphthaline in this very uncertain way. First, we may have it in our works; next we may have it in the holder, at the inlet and outlet; and then we may have it in the supplies. We investigate it, and we think we have a clue to its formation, when suddenly we find that our gathered tables of information amount to nothing, because the exact opposite has been proved in some other location. This illusive problem is what has annoyed me; and to enable me to to study the question more intelligently, after the general trouble which occurred this fall, I had some curves drawn on these charts which show the trouble in our city for several years past.

Mr. Nettleton—I would like to say that, in a general way, I think all our experience agrees that the trouble comes principally when we have the first cold nights in the fall, when there has been perhaps a hot sun the previous day, and the temperature falls 10° or 15° in the night. That has been my experience, and I think it has been the experience of Mr. Lamson?

The President—Yes.

Mr. Nettleton—It comes in the latter part of September or the first of October. Personally, I believe we have been helped by dropping the heats of the retorts and making the gas richer by putting in cannel coal. There is something, I think, in the idea of the absorption of naphthaline by rich hydrocarbon vapors. I presume many of you have tried the same experiment, and I do not think I am stating anything new. If the trouble begins in a general way I follow that course, and the trouble very soon ceases. But whether that is a sure remedy, or a remedy at all, I am not prepared to say.

Mr. Sherman—My attention to this subject of naphthaline was first directed to it last summer, in the month of August—which is the time we always examine the inlet and outlet pipes to the holder; and I then found that a 20-inch inlet horizontal pipe was almost closed up. I was greatly disturbed at the condition in which I found it. I do not think there was a 4-inch opening in the pipe. The deposit was so hard that we could make no impression upon it with steam or hot water, or with naphtha; and we had to take Wood's pipe cutter and cut the pipe out in sections, and drive the deposit out with bars. I never found it in that condition before. Later we found it in our distribution. It made us a very great amount of trouble.

Mr. Harbison—I think there is probably not a member of this Association who has not had experience with naphthaline. I have not yet been able to see a man, or hear him talk, who knew the cause of the formation of naphthaline. It forms in all parts of our works, at times, and also in our mains and service pipes; so there must be a cause. We are all reasonably busy men, and perhaps do not have either the time or the means to investigate one particular line; and it seems to me that as an Association we can not do ourselves more good in any one direction than in some way providing that some competent man (if there is such a one in the country) shall be employed, either by this Association alone, or by the concerted efforts of the various Associations, in discovering the cause of the formation of naphthaline. I throw out the suggestion to the officers of the Association, and ask whether it is not worthy their consideration—the subject of offering a sufficient monetary inducement to some scientist to devote sufficient attention to discovering the cause of the formation of naphthaline, and require a practical demonstration of his theory before he receives the reward. I think it would be a good investment to offer a sufficient inducement, and let us proportionately contribute towards it, so that we may not have this bugbear before us continually. We have had it in our Association meetings all over the country for more than 20 years. I heard one gentleman state that he got rid of his naphthaline by pouring naphtha over the top of the purifier material before putting down the cover; and that he had no naphthaline form afterward. At the same meeting someone else said he had tried that thing and choked up the outlet of the purifiers by doing it. There has been different experience in different places. We all have naphthaline in a greater or less degree. One beloved brother shakes his head; he has evidently not had it.

A Member—Only once.

Mr. Harbison—Then you must be the man to tell us how to prevent its formation; and I therefore have hope we will now get the solution of the problem.

Mr. Sherman—What was the temperature of the gas you were sending out at the station meter?

The President—In a general way (without quoting what it was month by month) we tried to keep the gas down to 58° and 60°. Of course, in the summer time all of us have difficulty in keeping the temperature down to anything like that; it is apt to be higher than 60°, but we try to send our gas out at 60°.

Mr. Sherman—During July and August we were sending out gas at our station meter at 80°. I am authorized by my directors to spend money on this question, and to employ experts to investigate. I was rather taken aback, on asking a prominent gas engineer what advice or information he could give me, for he replied, "You know just as much about it as I do, and that is nothing." That was said at the meeting where you had these records on exhibition.

Mr. McKay—At our works we had this same trouble with naphthaline in the same manner described by other speakers, but it has ceased entirely for the past two years. For two years before that we had a great deal of very serious trouble. Each of our holders has a 24-inch inlet and a 24-inch outlet, and when making gas, as cold weather came on, we had increasing difficulty in getting the gas into the holder, and found that we had to contend with naphthaline. Finally we had to throw aside the inlet pipe. In order to get the naphthaline out we made use of a method suggested by Dr. Wing. We put about 1,000 gallons of high grade naphtha into the inlet pipe, entirely sealing off the holder, and then shut up the pipe and heated the naphtha with steam. We weighed the naphtha when we put it in, and at the conclusion of the exercises we cleared from the two inlet pipes sometimes as much as 3,000 pounds of naphthaline. We partly determined the amount of naphthaline by taking the weight of the oil we put in and by afterwards taking the weights of the oil and naphthaline pumped out of the pipe, and we found that the naphthaline cleared from the pipe would vary from 1,000 to 2,000 pounds, assuming that as much was forced into the holder as was forced into the main, by volatilization.

Mr. Gifford—I would like to ask Mr. McKay if he had any trouble from leakages after his steaming process. I tried that once and have had a leak in my holder inlet ever since.

Mr. McKay—No. We took the temperature of the naphtha when it was heated; that is to say, we knew the temperature by pumping out

the condensed steam, and we took the temperature every time we pumped it. It did not rise very high, and did not cause the pipe connections or anything connected with the holder to leak.

Mr. Sherman—We tried the ordinary naphtha, but I was told that coal tar naphtha would do more efficient work. So we bought that and paid 50 cents per gallon for it. But that did not seem to have any more effect on it than the ordinary commercial naphtha.

The President—It is evident that Mr. Sherman is proposing to go into this subject very thoroughly this summer; and as he is authorized to spend money in the investigation—and I do not doubt he will—he will probably be able to give us a good deal of information at our meeting a year from now.

Mr. Harbison—It would be interesting if Mr. McKay would tell us why he has not had any trouble from naphthaline in the past two years, when previous to that he had lots of it.

Mr. McKay—I think the reason we had it at the time we did have it was because we were sending our gas into the holder too hot. We still have naphthaline, but we have it where we can take care of it. I think if gas is cooled sufficiently low before it leaves the station meter there will be decreased difficulty from naphthaline.

Mr. Harbison—What temperature would you consider sufficiently low?

Mr. McKay—I think it should be as low as 60°.

Mr. Sherman—I found some relief late in the season by leaving the purifying windows and doors open, and thus reducing the temperature.

Mr. Harbison—You do not have to do that in August.

Mr. Sherman—It was in August, September and October.

The President—I shall take the liberty of appointing a committee on this subject. I do not think this question is an old enough "chestnut" to throw away. I think there is a good deal to be found out about it. For the benefit of the Association, at its next meeting, I will ask Mr. Sherman and Mr. McKay to act as a Committee on Naphthaline, and to gather all the information they may be able to. Mr. Sherman seems to have made at one time a large quantity of a certain kind, and Mr. McKay at another time made a large quantity of another kind. I shall appoint those gentlemen a committee to report at the next meeting.

Mr. Sherman—I might say, as a matter of record, that we are making half water gas and half coal gas.

The President—We have on the circular another topic, "Electrolysis." The Secretary informs me that a Committee was appointed on this subject, of which Committee Mr. Addicks is the Chairman. Has he anything to say on the subject?

Mr. Addicks—I have nothing new to offer. The Secretary is also a member of that Committee, and he may have something to say.

Mr. Prichard—I have nothing especially new on the subject of electrolysis, except a case of my own, which possibly you saw in the American Gas Light Journal[1] a month or two ago, where a service pipe, two inches in diameter, was completely eaten up in three or four years. The railroad people seem to realize there is to be trouble from electrolysis, and they are attempting to obviate it by connecting their underground wires with an overhead wire which takes the underground current back to the station. The chief trouble we have to fear from that now is in our services, near the point where they tap the rails, etc., to take the current back overhead. They relieve the pressure from their ground work at this point, causing whatever current accumulates on our pipes to go towards that point, passing over our mains and services to their rails near this point where the current is taken up the poles. In the system of railways in our town they are doing that quite extensively, and no doubt it will relieve us very much. I have not heard any other cases reported.

Mr. Allyn—I am happy to say that during the last year we have had no serious cases or evidence of electrolysis. As I stated at the last meeting, our very efficient superintendent of wires has driven the West End Company into thoroughly protecting their lines, and as far as possible all of the rails have been doubly bonded by much heavier wire than was formerly used, and heavier return wires have been put in. A short time ago he told me that, although they are constantly making tests, he had discovered very little evidence of the presence of a current that would be injurious to the pipes. I did find one rather curious case this summer. We were laying a 16-inch pipe in a street where there had never been any electric wires, and in connecting up the services one of the services dropped apart. I had the pieces removed and showed them to our superintendent of wires, and he felt confident, as I did, that the cause of the trouble was electrolysis; but the question was where the current came from. He carried a voltmeter there and connected it to our pipes, and it showed no current whatever. But still we both felt confident that it was done by electrolysis.

Mr. Bush—I do not know that our experience in Brooklyn is different from that of a number of other cities where trouble from electrolysis has occurred. The roads were nearly completely turned over to the trolley system about the end of 1893, and since that time the corrosion of various pipes and cables has shown itself to quite a serious extent. Three methods for obviating the difficulty have been proposed. First, that the railroads put a much better bond on the rails—of much greater capacity—and so avoid a great deal of the leakage to the underground pipes and cables. Second, after all has been done that is possible to secure a good return, if there is still an escape, it is suggested that the pipes themselves be connected at various points to the rails, or to the return wires to the dynamo, thus taking the current back to the generator direct instead of through the ground. The third proposition was that a 3-wire system would obviate the entire difficulty. But inasmuch as the roads have a charter for a single trolley, that does not seem to be practicable. The roads have put in much heavier rails, and have bonded them more heavily—they have laid larger track wires; and, as has already been described here, they have in certain instances run overhead wires, and connected them to the track. And in addition to that they have in some instances connected the water hydrants to a return to the generator. And, as it more particularly affects gas companies, there have been some 10 connections made to one system of gas mains directly back to the rails. It has been found that these connections have greatly improved the condition of affairs as regards leakage from pipes. The potential of the pipes in many instances varied from 1 to 3 or 4 volts above that of the rails; and by these cross connections in most instances that potential has been reduced, and in many cases made negative. The railroad company is inclined to think that in that particular district there is no trouble at all going on at the present time. The gas company feels that this is very much in the line of experiment, and it cannot be said to be a successful one until it has had a chance to run and the results be observed. But I will say that in certain services which have been observed there is apparently no electrolytic action going on at the present time. We found that in one case, that of a service to a power house, an inch and a quarter service, as much as 300 amperes of current were taken into the power house by the connection made to our main. Before that connection was made the difference of potential from our pipe line to the negative terminal was from 17 to 20 volts. You thus see the necessity of some method of relieving the pressure.

Mr. Prichard—It seems to me, in the case cited by Mr. Bush, the railroad company have not done their duty by their own underground system, and are saving money by using his underground system to do their work. I think gas companies will later on find their mistake if they allow that work to go on. The railroad company should be required to improve their own underground system.

Mr. Allyn—I would like to say that, when I first discovered the difficulty in Cambridge, the superintendent of wires suggested doing this very thing, but in a little different manner; that is, in all large buildings where there were large water and gas supplies to wire the water and gas supplies together; but when he came to investigate the matter he said he was confident it would do us more injury than it would do good by furnishing the railroad company conductors for their return currents. The same suggestion was made with regard to water mains. I think that in quite a number of places they did connect them with heavy wires; but they were afterwards convinced that they had made a mistake, and discontinued the practice.

Mr. Taber—That suggestion is a very good one. It is very unsafe in my opinion to meddle with return currents unless you know just what conditions are existing. In a case where I was called the other day they were about to connect one line of pipes directly to the return wire, in one particular location, without knowledge of its electrical conditions. I stood aghast. They knew nothing about it. They did not even know the circumstances under which they were working. Connecting in that way meant that at some place they were going to get this return current when excited at its highest rate to part with it later in similar ignorance. It would have been far better to let the thing alone until they knew how to make their addition to the inefficient railroad installation serviceable and harmless to them, which they finally decided to do. I think a far better way is to use your influence with the company and have them put in their return wires in good shape and of good size; and let some one's else dynamo alone; for you don't know where you will land if you tackle that.

The President—This is a subject vitally interesting to gas companies,

1. See Journal, Dec. 30, 1895, p. 1060.

and I think it will be your wish that this same committee on electrolysis shall continue in existence. The members of that committee are Mr. Addicks and Mr. Prichard. I will ask any gentleman having data, or matters of interest in connection with this subject, to communicate with these gentlemen from time to time, and at the next meeting we shall expect to hear something more from them. There is another topic mentioned in our question box: "What hours are usually included in the day consumption at different times of the year?" It has been suggested that we decide upon some uniform way of determining this. If the gentleman who put that question in the box will give his reasons for it, it will perhaps start the discussion.

Mr. Gifford—As you call for a confession let me say I am responsible for that question. I was prompted thereto for the reason that our Treasurer asked me the other day, when I gave him the usual figures (as I do every month), of day consumption, what other people were doing in that connection, and what other people called day consumption. I told him I did not know. On inquiry among some gentlemen here I found that they did not seem to know. Now, with us the day consumption is a very attractive thing; and, dating back for quite a number of years, we have tried to cultivate it. We have also kept a record of the consumption of gas consumed other than that used during the lighting hours. Our practice has been to take from 6 o'clock to 6 in the summer months, and in the winter months from 7 in the morning until 5 in the afternoon, and during the shortest days from 7 to 4:30.

The President—How would you suggest that the matter be considered?

Mr. Gifford—It occurred to me, after conference with some other members, that possibly a Committee might be appointed to suggest, if thought desirable, a uniform practice; and perhaps we can get some one to send out some circular letters.

The President—Mr. Gifford proposes a Committee to consider this question. Anything which tends to our having uniform methods of keeping our accounts is of course of value. On this question of day consumption, if we could only agree to consider as day consumption the gas used between certain hours at different seasons, it would be an excellent thing. Mr. Gifford suggests a Committee—of which he shall be Chairman—to send out circular letters and get this information.

Mr. Harbison—I move that such a Committe be appointed by the Chair, and that Mr. Gifford be that Committee. [Carried.]

The President—I think that a Committee of one is sufficient for the purpose; and Mr. Gifford is appointed on that Committee.

Mr. Coggshall—I think this is a move in the right direction. Among the interrogatories put to us by the Commissioners is this same question, "What per cent. of your output is day consumption?" We ought to fix upon some period at different seasons of the year and call that the day consumption.

The President—I think the suggestion is a good one; and the Committee would do well to confer with the Gas Commissioners and have an understanding on this point.

Mr. Sherman—This is a question of more importance than appears on its face. Most of us, if we have thought anything on the subject, and were asked what proportion of storage we should have to our business, would give the old stereotyped answer that we should have sufficient storage for the largest demand on us in 24 hours' sendout. The conditions are now all changed. Some of us have gone on to build holders on that theory, and then found we did not need them. The day consumption has come in and altered that entirely. What was a proper answer to that question ten years ago is not a proper answer to it today. Now we do not need storage capacity equal to our largest sendout by a good deal. We can get along with a great deal less. What we want is storage capacity sufficient for our night demand.

The President—Is there any other business to be brought before the Association? While I would like to have you continue the session as long as you would willingly stay here, I feel that, it having been decided that there shall not be an afternoon session, and it is now lunch time, I have no right to keep you much, if any, longer. If there is any special business that any member has to propose I shall be glad to hear it; if not, a motion to adjourn will be in order.

Votes of Thanks.

Mr. Harbison—Before we adjourn I think it is due to ourselves that we take into proper consideration and recognition the very able and efficient manner in which the President has performed the duties which devolved upon him during the past year, and at this session. He has presided over the deliberations of the convention with extreme consideration for the members, and with thoroughness and efficiency, in his usual modest and becoming manner. I move a rising vote of thanks be tendered the President for the way in which he has performed his official duties. [Seconded by Mr. Neal, and adopted unanimously.]

The President—Gentlemen, I am very much obliged to you for your attendance, and for your close attention to the discussion of the papers; and I want at this time to congratulate you on the success of your meeting. I think I may well say that up to this hour of adjournment all things have been satisfactory in the way of disseminating information such as we want. I hope you will not leave without passing a vote of thanks to our Secretary. I move the thanks of the Association be given Mr. Prichard for the efficient manner in which he has conducted the affairs of the Association during this and other years. [Seconded by Mr. Allyn and unanimously adopted.]

The Association then adjourned.

How the Electric Current is Generated.

By Mr. Sydney F. Walker.

For electric lighting and transmission of power we are confined to the two stores of energy, as the writer prefers to call them—coal, and water stored at a height above the sea level. Wind power could undoubtedly be used, but in this country it is too uncertain. The energy stored in certain metals, such as zinc, when in the presence of certain chemical salts, could also be employed, but is at present too expensive. In falling water we have the energy derived from the sun in the process of evaporation. At the period of its cycle at which we are able to make use of it, a large portion of the original stored energy has been given up, and has either been transformed into another form of energy or has gone to enrich some other bodies. In falling a certain distance we cause the water to work a turbine or water wheel, and we have here the transformation merely from direct vertical motion to rotary motion. The turbine, or the water wheel shaft, communicates its rotary motion directly or indirectly to the armature of the dynamo, and another series of transformations immediately takes place, which will be dealt with presently.

In coal we have energy stored in the chemical form. By combination with the gases of the atmosphere we are enabled to liberate a portion of the energy stored in the constituents of the coal, and in the gases, in that form of molecular motion known as heat. By suitable arrangements we impart this molecular energy to the water in a steam boiler, causing it to go through the process of rising in temperature, and finally to pass into the gaseous form we know as steam. Here we have accomplished exactly the same thing at second hand that the sun has done with the water of the ocean, rivers, etc., at first hand. But while with the water that is subject to the sun's direct action, we are only able to use a portion of the energy imparted to it by the sun—that due to its position; with water converted into steam, we use the expansive force of the steam, the energy that has been stored in the water, both in the process of converting it into steam, and that has been added to it after. Here, then, is the first conversion—the energy stored in the chemical form becomes heat, and, passing into the water, is stored there ready for use. Again, we are not able to recover all the energy from the steam that we have passed into it from the coal, and the gases with which the constituents of the coal combine. There are constant transformations going on, carrying off portions of the energy supplied by the coal. A portion of the energy imparted to the steam, of the molecular motion, now exerted as an expansive force, when used in the cylinder of a steam engine gives us once more motion of translation, which is readily converted into rotary motion, or rotary motion directly; and, again, this rotary motion is communicated directly or indirectly to the revolving portion of the dynamo, usually its armature.

And now as to the next series of conversions. Our mechanical energy is first transferred into electrical energy, which is used to set free the magnetic energy in the masses of iron of which the dynamo is composed, and from which a further conversion into electrical energy takes place in the form of electric currents, ready to be again converted into heat and light, or to be reconverted into the motion of translation known as mechanical energy. And how does this come about? Consider the structure of a dynamo machine. It consists of masses of iron, some solid and some in thin layers, having copper wires coiled round them, the copper wires being insulated by wrapping them with cotton or other suitable material. A portion of the copper wires surround the large masses of iron, usually stationary, called the electromagnets or the field magnets. The other portion of the copper wires surrounds the laminated mass of iron, which usually revolves, and which we call the armature. These wires, with their insulating covering, if the writer's view is correct, are merely channels along which

the electric waves, the waves of molecular motion pass, the insulating covering being the wall or tube, which tends to prevent the escape of the molecular motion. The passage of these molecular waves round the masses of iron causes the phenomena of magnetism within and around those masses, and the passage of the coils of wire surrounding the armature, anywhere in the neighborhood of these field magnets, gives rise to or generates electric currents.

A little consideration will show us that the masses of iron are storehouses of energy, just as the clouds and the coal beds are, though in another form. The iron cores, the iron slabs of which the field magnets are composed, hold within them a certain amount of molecular energy of the form known as heat, just as every other body does, and, as we know, they are capable of storing a large amount of heat energy. But they are also storehouses of a form of energy peculiar to themselves, and possessed by only a few metals, viz., magnetic energy. Magnetism the writer conceives to be yet another form of molecular motion with which iron and its compounds, as well as nickel and cobalt, were endowed at their creation. It is evidently a peculiar form of motion, probably an oscillation thoughout each molecule, in such a manner that one end of each molecule would appear to be endowed with a pushing force or pushing motion, while the other end is endowed with a pulling force or motion. When a piece of iron is in the non-magnetic state, the molecules form closed figures in such a manner that these pushing and pulling forces are satisfied. If this state of molecules is disturbed, they turn outwards, more or less, as impelled by the disturbing force, and the pushing and pulling forces then becoming unsatisfied, lines of force, as electricians term them, lines of molecular motion as they are in fact, are sent out in all directions, a portion of them escaping beyond the mass of the iron itself and forming those curves we know so well. As we know, a smart rap with a mallet on a mass of iron, especially very pure iron, will create the condition known as act ive magnetism, though only to a small degree. Here we have energy, motion communicated by means of the blow of the mallet to the molecules of the iron, and compelling them to take up new positions and to display their peculiar molecular motions. The presence of another magnet will do the same, whether it be what we call a permanent magnet or one created by an electric current.

The readiest method, however, and the one from which we can obtain the most powerful results, is by means of electric waves, electric currents passing around the iron. By means of electric currents we are able to produce the phenomena of magnetism in the very largest masses of iron, and within certain limits, to almost any extent we please. By their aid also, we are able to produce these same phenomena in the most magnetically refractory iron compound, though not to the same degree as with pure iron. What is it that we do, when we pass a current of electricity round a mass of iron, or other magnetic body? We impress one motion upon another, the molecules obeying the resultant of the two. The iron molecules are already in possession of one form of motion peculiar to themselves. What we term an electric current is another form of motion, a wave motion. We confine this motion partially, by surrounding the channels in which the waves are passing with substances that do not readily accept the wave motion, in the form in which it is present in the conductor. An escape of the wave motion does take place, however, and necessarily a transformation; the escape being in circles surrounding the conductor in which the wave is passing, the transformation is into a higher rate of motion with a shorter wave length, and in this form it impresses itself upon the motion already present in the molecules of iron, the result being that other motion we know as active magnetism. Where the iron is impure, that is to say, where, according to the latest researches, the iron molecules are surrounded by other substances which tend to hinder their freedom of motion, the production of magnetic phenomena requires the expenditure, or rather the transformation of more energy than where the iron is pure; and, on the other hand, in those compounds of iron where this rules, the magnetic phenomena once produced, are more persistent after the impelling force has been removed. The molecules of iron cannot so easily resume their former positions.

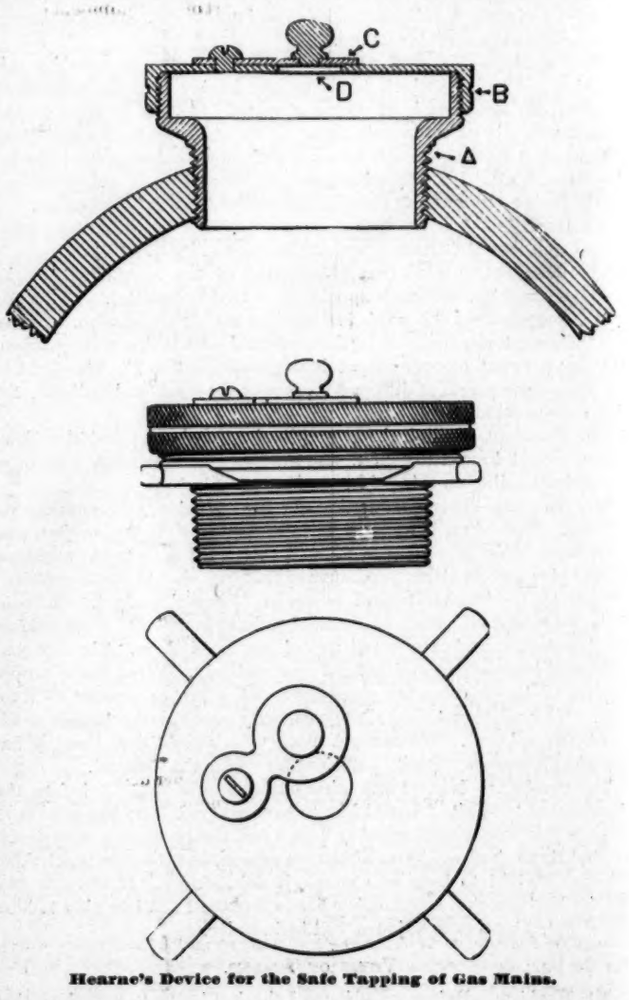
And now as to the next transformation. Assuming that the iron of the field magnets has been magnetized, as we call it, that the lines of force or lines of motion have been sent out, across the space in which the conductors on the armature are moving, how does the passage of these conductors across these lines of motion create the molecular motion we know as electricity within the moving copper wires? Again, we have two motions—that of the lines of force, which must be a real motion, as it is able to turn a freely suspended piece of iron in its own direction and keep it there; and we have the motion of translation imparted to the wires by the engine or turbine; and again, we have a blending or combination of the two, an electric current being the result. Just as the motion of translation of a falling rock, on the rock striking the ground, or that of a shot expelled from a gun on striking its target, is converted into the molecular motions we know as sound, heat, and sometimes light; so the motion of translation imparted to the wire conductors, on the armature of the dynamo, impressed upon the motion present in what we call lines of force, is transformed into the molecular motion we know as an electric current.

As we should expect also, the greater the rapidity of the motion of translation in any individual conductor, and the greater the motion present in the lines of force—in other words, the greater the energy impressed on the moving conductor, whether in the form of magnetic or mechanical energy—the greater is the resultant electrical energy developed. It follows also that to add to the electrical energy generated, transformed from the other stores of energy, we may add to the conductors under treatment; or, in dynamo parlance, add to the number of turns on the armature.

The Hearne Device for the Safe Tapping of Gas Mains.

Mr. John Hearne, of 472 Kent avenue, Brooklyn, N.Y., forwards us the accompanying drawings, which virtually explain a method devised by him for saving gas bags used in bagging off live gas mains, and in reducing to a minimum the danger to which the men engaged in such work are often subjected.

The cutting or rupturing of mains very often leads to serious results, not only in the loss of bag or bags, but in the asphyxiation of the workmen, which asphyxiation often ends fatally. In the latter case the result is often costly to the company.



Hearne's Device for the Safe Tapping of Gas Mains.

In Mr. Hearne's experiences with the laying and repairing of mains, and the putting in of specials as well—an experience extending over 25 years—he found that the bags were often injured when being inserted in the mains. Again, injury often followed their removal through

rough contact with the thread of the hole, or from a small jagged sliver or slivers left after the tapping. No matter how expert a man may be in this particular branch, when he finds the gas coming upon him, he will naturally grow excited, and in his pardonable haste will tug at the bag with no restrained hand. When one considers the fact that it takes a pretty strong lunged man to withstand the effect of the gas that escapes during the blowing up or inflating of a 20-inch bag after its insertion into the main, the flow of gas being presumably stopped by the primitive method of using crude clay or some other soft material, it will scarcely be wondered at that so many pipe fitters are "knocked out." In fact, it is not an uncommon thing to hear the remark, delivered with a prolonged sigh of relief, "Well, no matter about the loss of the bags, as long as we have made the connection." Now, if the connection can be made and the bags saved, surely a gain has been achieved. The Hearne device will obviate many of the troubles connected with work on live mains, and will undoubtedly inspire confidence in the men. Although the cuts really explain the device without the need of word interpretation, it may be said that a leading feature is the hole in the top or cap to allow the neck of the bag to protrude. Then, the top being screwed down, the flow of gas during the time of inflating the bag is prevented. The sizes are from 1 inch to 3 inches, making 6 pieces, which in duplicate means in all 12 pieces, all in nicely finished brass.

A Cheap and Reliable Exhauster Governor.

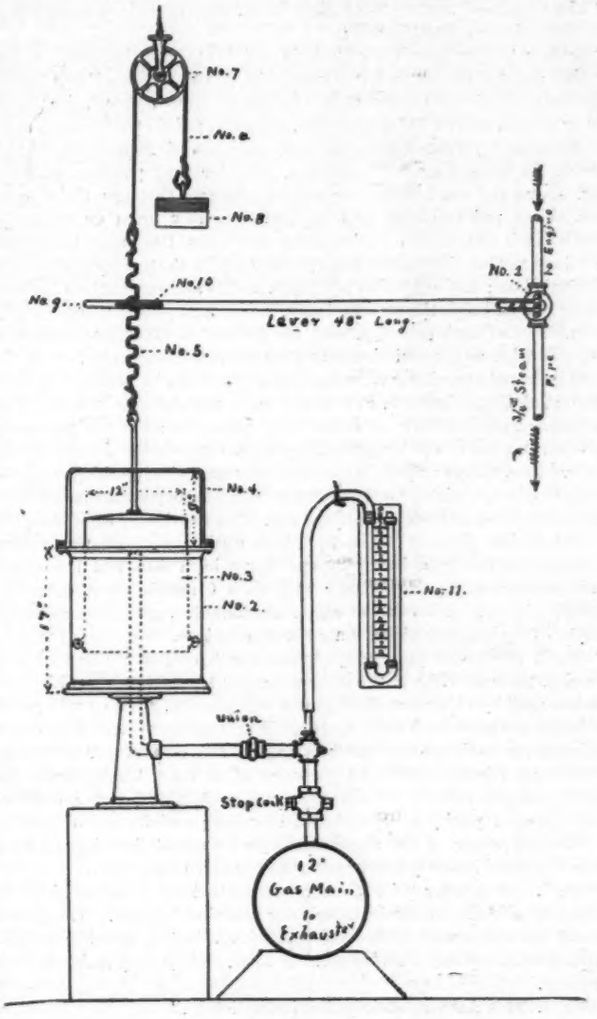
[Prepared for the JOURNAL, by MR. F. EGNER.]

A governor which will control the action of the exhauster (steam-jet or rotary) within desired limits is a useful part of the equipment of any gas works; and if that apparatus can be had, not only absolutely reliable, but also at a nominal expense, it may be said to be a desirable thing to have. The accompanying illustration gives a view of an exhauster governor which combines utility with cheapness.

It is not a patented article, can be made by any handy mechanic—excepting the valve, which can easily be procured of dealers in engineers' supplies—and it has, in the writer's experience, given better satisfaction than many other forms of exhauster governor; and that is saying a good deal.

No. 1 in the drawing is a so-called "chronometer governor valve"—that is the name of the valve in the catalogue of the dealers from whom we obtained ours. Its price was less than $5. No. 2 is the waterpot of an old, discarded governor found in our scrap pile; the dimensions are given to enable anyone to make a similar pot out of any handy material. No. 3 is the drum or bell of the governor, made of thin galvanized iron. No. 4, the guide of the drum, is ¼ inch by 1¼ inch flat iron. The guide-rod of the bell is half-inch round iron, with suitable fastenings, as shown. No. 5 is a piece of $\frac{5}{16}$-inch iron wire, bent in the form seen, and fastened to the guide-rod at one end, and a piece of sash cord (No. 6) passing over guide pulley (No. 7), and held in tension by weight (No. 8), as shown. The zig-zag wire engages a wooden lever (No. 9) at one end, where it is held in place by a light, flat spring, at No. 10, the other end being fastened, by means of two light carriage bolts, to the lever which forms part of the valve. This wooden lever is 1½ inches by ¾ inch at point of connection to valve, and tapers toward the wire end, as shown. Suitable guide-wheels for bottom of bell of governor, as well as the one over which the tension cord passes, can probably be had at any hardware store. Pulley (No. 7) should be of a good size; and, naturally, the better the finish of the pulleys and the easier to move the better the action of the governor. No. 11 is a home-made U-gauge; but which probably had better be purchased from some of the people who furnish your meters, since they all make and sell them. The pipe fittings shown probably require no further description. The whole is connected, like all exhauster governors, to the inlet end of that apparatus.

By adding or removing weights at point (No. 8) any desired pressure or vacuum may be maintained, as will be indicated by the gauge. The governor-drum is given a rather wide range; but it is done because the same governor regulates (according to which is in use) either a rotary or a steam-jet exhauster. The wide range of the zig-zag wire is for the purpose of setting the governor to operate with either a high or a low pressure of steam. In our case, if we raise the lever to the top notch of the wire the governor will control the exhauster, with steam at from 40 to 60 pounds per square inch; while, in the evening, when we carry 90 pounds per square inch, the lever is lowered three or four notches, which manifestly is a simple thing to do. This governor will, for example, while we are making coal gas, jog along evenly part of the day, and when in the evening the relief holder is turned on, and water gas making commenced, will permit the exhauster to jump from an hourly make of about 6,000 cubic feet to 18,000 and 20,000 per hour, maintaining the same vacuum as in the beginning, within 10 seconds after turning on the said relief holder valve. Likewise, when shutting off the water gas, the governor will slow down the engine within a few seconds, without any attention on part of the man in charge of the apparatus. Every exhauster governor ought to do this, of course; but the writer has never yet had one which *did it*, with so



wide a range, as this simple, home-made machine. This is the governor mentioned in the articles on "Water Gas without Oil" and on "Purification," recently published in the JOURNAL. But let the reader note that, no matter how good an exhauster governor may be, it can hardly be expected to work well if hadicapped with a heavy fly-wheel on the exhauster engine shaft, which however good and desirable on the shaft of a saw mill or factory engine, is entirely out of place on the gas exhauster. This has repeatedly been spoken of by the writer, who has practically demonstrated the correctness of his views on that subject, with exhausters, ranging from a small No. 1 and No. 4 Mackenzie, up to a No. 9 Roots. The exhauster ought to have a light balance wheel, and will work better without any whatever than with the unwieldy abominations which are seen too often in otherwise admirably constructed exhausting apparatus. Why will makers of gas exhausters not be advised, and save money for themselves and trouble to their patrons, by simply putting less metal in the gas exhauster, engine balance wheel, and thus give even a high priced governor a chance to do its work?

MR. LORIN F. JUDD, a Director in the New Britain (Conn.) Gas Light Company, and one of the best known business men of New Britain, died at his home in that city on the night of the 10th inst. Mr. Judd was born in New Britain, February 3d, 1820, and all of his busy career was passed in the place of his birth.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following is the text of the bill introduced in the State Senate, on the 4th inst, by Senator Jacob Cantor, mention of which was made in the last issue of the JOURNAL:

"An Act to authorize and regulate the manufacture and supply of gas by the New York Carbide and Acetylene Company in the counties of New York, Kings, Queens, Richmond and Westchester.

"The people of the State of New York, represented in Senate and Assembly, do enact as follows:

"Section 1. The New York Carbide and Acetylene Company, a corporation heretofore incorporated under the general laws of this State, is hereby authorized to manufacture and supply gas for producing light, heat or power, and in lighting streets, avenues, public parks and places, and public and private buildings in the counties of New York, Kings, Queens, Richmond and Westchester, and for that purpose may lay pipes, mains and conductors for conducting gas through the streets, lanes, alleys, public places and highways in any town or village in either of such counties in like manner and upon the same terms and conditions as Gas Companies incorporated under the transportation corporation's law; and may also lay pipes, mains and conductors for conducting gas through the streets, lanes, alleys and public places in any city in either of such counties, with the consent of the Commissioner of Public Works, or Commissioner of City Works of such city, or of the officer or board exercising corresponding functions in such a city having no such Commissioner, and under such regulations as such Commissioner or other officer or board may prescribe; but no pavement shall be removed or opening made by such corporation in any of the streets, lanes, alleys or public places in any such city for the purpose of laying its pipes, mains or conductors until such corporation shall have made application to such Commissioner, officer or board for consent to lay such mains, pipes or conductors, nor until a consent prescribing the manner of doing such work shall have been obtained from such Commissioner, officer or board; and such Commissioner, officer or board shall grant such consent under reasonable regulations as to the manner of laying such pipes, mains or conductors.

"Sec. 2. Such Company may charge for illuminating gas in any such city, town or village, the same price per 1,000 feet allowed by law to be charged by other Gas Companies in such city, town or village respectively, for gas which shall have an illuminating power of 25 sperm candles of six to the pound and burning at the rate of 120 grains of spermaceti per hour, tested at a distance of at least 1 mile from the place of manufacture by a burner consuming 5 cubic feet per hour of the standard of purity now established by law; and for gas of greater illuminating power of the standard of purity established by law may charge a proportionately increased price per 1,000 cubic feet.

"Sec. 3. No greater price than is authorized by this Act shall be charged by said Company for supplying illuminating gas. The provisions of general laws, not inconsistent with this Act, relating to Gas Companies incorporated under general laws, shall be applicable to such Company.

"Sec. 4. This Act shall take effect immediately."

ON the day the bill was introduced it was read twice and ordered printed, with the later instruction that, when printed, it should be committed to the Committee on Municipal Corporations. On the 12th inst. the bill was reported from Committee and passed in the Senate by a vote of 33 for to 1 against. It is now in the Assembly, in the hands of the Committee on Gas, Water and Electricity.

A CORRESPONDENT in Middletown, N. Y., writing under date of the 13th inst., says: "The proprietors of the Middletown Gas and Electric Light Company are now convinced that they made no mistake when they secured the services of Mr. W. J. Max as Superintendent, for he has proved to be the most popular and energetic one the Company ever had. Mr. Max took charge March 1st, 1894, and up to January 1st, 1896, has secured 148 new consumers. During 1894 more gas was sold than in any previous year in the history of the Company, but the quantity metered in 1895 passed all expectations. A large leakage had troubled the Company, but the works and mains are now in such excellent shape that the leakage is far below the average. Important main extensions are contemplated this spring to meet the demand for gas in districts not now supplied. Although over 300 gas stoves are now in use in Middletown, the Company desires to increase the number, and to that end has offered a large gas range, free of cost, to every consumer that agrees to use $25 worth of gas before October 1st. This scheme has proved so popular that, judging from the orders coming in, it is estimated that at least 100 will be set by June 1st."

THE Berlin Iron Bridge Company, of East Berlin, Conn., reports plenty of work, calling for the operation of the entire plant with a full force of men. The Company reports contracts lately completed as follows: New casting shop and machine shop for Randolph & Clowes, Waterbury, Conn; new car house, engine room and boiler house for the Bergen County Traction Company, at Fort Lee, N. J.; a new steel tube plant, including power house, accumulator house, coal storage, etc., for the Pope Mfg. Company, Hartford, Conn.; two bridges for the American Sugar Refining Company, at New Orleans, La.; new power house and boiler plant for the Hackensack (N. J.) Gas and Electric Company; a large foundry for the Bagley & Sewell Company, at Watertown, N.Y.; a large machine shop for the Granger Foundry and Machine Company, at Providence, R. I.; an iron bridge consisting of 5 spans of 200 feet for the Penobscot Company, Maine; a new car shed building for the Third Avenue Railway Company, at Harlem river, N. Y.; three large buildings for the Standard Oil Company, at Constable Hook, N. J.; a new forge shop for the Pratt & Whitney Company, Hartford, Conn.; a new storage house for Messrs. Bradley & Hubbard, Meriden, Conn.; a new tube plant for the Coe Mfg. Company, Torrington, Conn.; and a large extension to a process house for the Solvay Process Company, at Syracuse, N. Y.

THE Bartlett Lamp Manufacturing Company, 137 and 139 West Broadway, this city, has been named as the Agent of the Keystone Meter Co. for the States of New York, New Jersey and Connecticut.

THE proprietors of the Pawtucket (R. I.) Gas Company are considering the advisability of reducing the gas rate. In any event the reduction will not go into effect before July 1st.

COMPLETING our reference to and extracts from the annual report of Mr. Charles D. Jenkins, Inspector of Gas and Gas Meters for the State of Massachusetts (our prior references thereto will be found in our issue of last week), we find the following: "As ammonia has a market value worth considering, and as it is not difficult to remove a large proportion of it, the Companies generally keep below the legal limit of 10 grains per 100 feet of gas; but when the apparatus is small compared with the output, so that the gas is washed quickly, the ammonia frequently reaches the vicinity of 10 grains. But as to sulphureted hydrogen very little excuse can be offered for its presence but accident or carelessness. It may be very easily detected by holding a paper, moistened with lead acetate solution, in the gas stream from a burner tip for a half minute or less; a brownish or black stain indicates sulphureted hydrogen. This gas is removed by washing with water or ammoniacal liquor and then passing through lime or iron purifiers, and should be completely taken out. Sulphureted hydrogen is poisonous if inhaled, corrodes fixtures, gas cocks and meters, and does not improve the gas in any way. A trouble not usually looked for, especially in the smaller works, is the fouling of the water in the holder tanks, by the absorption of ammonia and sulphureted hydrogen. Although this has been noted in former reports, yet the past year Amesbury has incurred a fine for sending out gas fouled with sulphureted hydrogen from the tank water, while the gas was being properly purified and put into the holder clean. The Companies making gas from petroleum or its products do not, as a rule, purify their gas with lime or iron, a simple washing being sufficient; but last year, by using a different or more impure petroleum, some of the Companies made a gas requiring more thorough purification to get rid of sulphureted hydrogen—a process for which they were not prepared. The following eudiometric analysis has been made, the two at Holyoke with a view of determining, if possible, the reason for low candle powers, and the remaining three in connection with calorific tests:

Place or Company.	Candle Power.	Illuminants.	Marsh Gas.	Hydrogen.	Carbonic Oxide	Nitrogen.	Oxygen.	Carbonic Acid.
Holyoke.....	16.0	5.55	35.25	50.60	6.60	1.90	—	0.10
Holyoke.....	18.7	6.67	37.75	47.39	5.99	2.00	—	0.20
Boston.....	25.0	14.98	25.90	27.87	25.30	3.04	—	2.91
South Boston...	24.7	15.40	22.84	29.88	26.22	2.89	—	2.77
Cambridge.....	17.0	4.88	33.90	46.15	6.82	6.50	—	1.75

From the increasing use of gas for fuel purposes, it has been thought desirable to make some tests of the calorific power of various kinds of gas but, owing to the difficulty of obtaining the necessary apparatus and of getting it into shape to carry about, only a start has been made.

The apparatus used was Junker's calorimeter, and the method consisted in determining the increase in temperature of a definite volume of water and the amount of gas used in doing the work. From these results the heat units per cubic foot of gas are easily figured. Boston gas, an analysis of which appears above, was found to have a calorific value of 681.8 British Association units; that is, the heat given off from the burning of 1 cubic foot of this sample of gas would raise the temperature of 681.8 pounds of water 1° F. In like manner, South Boston gas, candle power 24.7, specific gravity .656, was found to have a calorific value of 634.8 units. When the test was made at Cambridge the gas was somewhat poorer than the average at that place, and so the results show what a poor coal gas will do; the candle power being 17, the specific gravity .497, and the composition as in the table of analyses, the calorific value was found to be 576 units. The Assistant Inspector, Mr. L. S. James, is doing his share of inspections creditably."

PRESIDENT FULLER and Secretary Corscot deny the report that the Madison City (Wis.) Gas Light and Coke Company has changed hands.

THE Passaic Lighting Company is the name of the corporation under which the Passaic (N. J.) City Gas Light Company and the Passaic Electric Light Company have been consolidated. It is proposed to concentrate the plants on the Ann street site. The Directors are: G. A. Hobart, Paterson; B. W. Spencer, R. Morrell, W. R. Brown, G. D. Bogart and John A. Willett, of Passaic; H. P. Gawtry and H. P. Brown, of New York, and Alfred S. Elliott, of Wilmington, Del.

MR. WALTER H. BOOTH, of Binghamton, N. Y., has been appointed Secretary of the Hornell Gas Company, of Hornellsville, N. Y.

IT is positively stated that the San Francisco Gas Light Company and the local Edison Light and Power Company have formed an alliance that is virtually a consolidation.

THE Brattleboro (Vt.) Gas Light Company will install a 250-horse power engine in its electric lighting annex.

THE term of Mr. Morris Schaff, of the Massachusetts Board of Gas and Electric Light Commissioners, expires on July 1st.

THE Peninsula Gas Light, Fuel and Power Company, to supply gas in Newport News, Va., has been incorporated. It is capitalized in $100,000, and its projectors have applied to the City Council for a franchise.

AT the annual meeting of the Nashville (Tenn.) Gas Light Company no change was made in the executive management.

AT a meeting of the Directors of the Citizens Gas and Electric Company, of Jacksonville, Fla., the following resolutions respecting the Company's appreciation of the services of Mr. L. Z. Baya, who recently resigned his position of Secretary and Treasurer, were adopted:

"*Whereas*, Our former Secretary and Treasurer, L. Z. Baya, having severed his connection with this Company; and

"*Whereas*, The Board desires to put on record its appreciation of his valuable services while connected with the Company; therefore, be it

"*Resolved*, That this Board expresses to Mr. Baya its appreciation of his faithful and efficient services while Secretary and Treasurer of the Company, and extends to him its good wishes for his future welfare."

AT the annual meeting of the Gettysburg (Pa.) Gas Company the following officers were chosen: Directors, Jesse M. Walter, J. W. Diehl, George J. Benner, J. B. McPherson, H. B. Nixon and P. M. Bikle.

THE proprietors of the Grand Rapids (Mich.) Gas Company have determined to construct a storage holder, the vessel to have a capacity of 1,000,000 cubic feet.

MR. WILLIAM ANDERSON'S pipe cutting machines are finding favor with the gas men. Among recent orders filled by him are: A No. 2 machine to the Williamsburgh branch of the Brooklyn Union Company; a No. 2 to the Hartford City Gas Light Company; and a No. 1 to the Clinton (Mass.) Gas Company.

THE Gray syndicate has succeeded in acquiring control of the Norristown (Pa.) Gas Company, and on the 6th of April application is to be made to the Governor for a charter for the "Citizens Gas Company of the borough of Norristown, Pa.," under which title the Company will hereafter be known. The applicants for the charter are: John I. Rogers, Jerome B. Gray, Levi G. McCauley, John B. Henkle and Charles D. Hauk.

AT a meeting of the Fort Worth (Tex.) Light and Power Company, which was presided over by Mr. Henry C. Scott, a resolution was adopted directing that the rate for gas supplied for illuminating purposes be reduced from $2.25 to $1.80 per 1,000 cubic feet, and for fuel account from $1.50 to $1.33. If we mistake not, this schedule puts the Fort Worth Company in the position of selling gas at the lowest rate in Texas.

THE City Council of Asbury Park, N. J., have granted the Consolidated Gas Company, of New Jersey, the right to open the streets for the purpose of making main extensions. The main stipulation is that the work shall be completed by May 1st.

THE Springfield (O.) Natural Gas Company and the Springfield Gas Light and Coke Company, have agreed to merge their interests. The President of the amalgamated Company will be Governor Bushnell, and the Vice-President and General Manager will be Mr. J. W. R. Cline.

THE full text of the gas bill for the District of Columbia, as the same passed the House of Representatives, is appended:

Section 1. That the Washington Gas Light Company, of the District of Columbia, is authorized to charge and collect, after the passage of this act, for illuminating gas furnished to and paid for by the government of the United States and other consumers in the District of Columbia, at the rate of not exceeding $1 per 1,000 cubic feet: Provided, That if consumers other than the government shall not pay monthly any gas bill within ten days after the same shall have been presented, said Company may charge and collect from said consumer so failing to pay said bill as aforesaid $1.25 per 1,000 cubic feet for the gas furnished to said consumer during said month.

Sec. 2. That the Georgetown Gas Light Company, doing business in that part of the District of Columbia formerly known as Georgetown, is authorized to charge and collect, after passage of this act, for illuminating gas furnished to and paid for by the government of the United States and other consumers in that part of the District of Columbia, at the rate of not exceeding $1.25 per 1,000 cubic feet: Provided, That if consumers other than the government shall not pay monthly any gas bill within ten days after the same shall have been presented, said Company may charge and collect from said consumer so failing to pay said bill as aforesaid $1.50 per 1,000 cubic feet for the gas furnished said consumer during said month.

Sec. 3. That Section 1 of an act entitled "An act regulating gas works," approved June 23, 1874, is amended so as to read as follows: "That from and after the 30th day of June, 1874, the illuminating power of the gas furnished by any gas light company, person or persons in the District of Columbia shall be equal to 22 candles by the Bunsen photometer, using the English Parliamentary standard Argand burner, having 15 holes and a 7-inch chimney, consuming 5 cubic feet of gas per hour; and such gas shall not contain more than 20 grains of sulphur in any form in 100 cubic feet, nor more than 5 grains of ammonia in any form in 100 cubic feet, and shall be free of the impurity known as "sulphureted hydrogen," said impurity to be determined by passing the gas through a glass vessel containing strips of bibulous paper moistened with a solution of the acetate of lead, and if any discoloration of the test paper is found to have taken place this is to be held conclusive as to the presence of sulphureted hydrogen in the gas. When the illuminating gas supplied by any Company, person or persons in the District of Columbia shall at any one time be of less illuminating power or of less purity than according to the standard just heretofore given, it shall be so reported by the Inspector of Gas and Meters to the Company, person or persons supplying the same, who shall be subject to a penalty of $100, to be recovered before the proper tribunal and paid into the treasury of the District of Columbia aforesaid for each day during which such violation shall continue: Provided, however, That if it shall appear that such deviation from the above named standards could not have been prevented by ordinary care and prudence, but was occasioned by some unavoidable causes, then the said penalty shall not be enforced."

Sec. 4. That any Gas Company or person placing a gas meter in service in the District of Columbia that has not been inspected, proved and sealed, as provided for by the act of March 3, 1873, entitled "An act making appropriations for the expenses of the government of the District of Columbia for the fiscal year ending June 30, 1894, and for other purposes," for each and every such violation of said act shall be subject to a penalty of $100, to be recovered before the proper tribunal of the District of Columbia.

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MONDAY, MARCH 23, 1896.

Development of Electric Light Engines.

In a paper on development of the electric light engine, read by H. Lindley before the Northern Society of Electrical Engineers of England, it was stated that although *per se* slow speed had certainly obvious objections, for some reason or other slow speed engines were to-day still much used for driving high speed electric lighting machinery. It was not difficult to find a reason for this in the fact that it was in the nature of a legacy from past ages. The up-to date Lancashire mill engine entered the field of electric lighting almost completely prepared for the work; the only objection was that in the early days of electric lighting it was rather too big, and there were then not many large installations requiring to be driven, and it soon became evident that the newly opened out field of electric lighting was likely to require the services of a large number of small sized steam engines. This led to the birth of the modern moderate speed engine, and one that would do without flinching the work that calculation showed it capable of doing, and would keep running for considerable periods of time. In these engines special features had, of course, to be introduced; firstly, the stroke wanted shortening, and then the bearings had to be increased, and it was some time before a correct proportion was arrived at. Lubrication also became an important question, and the large number of wick and screw adjustment oilers was now replaced by a central oil box, with a pipe to each important bearing and having a sight drop arrangement, so that the supply could be cut off without altering the adjustment, while by still more perfect means of lubrication a crank pin or main bearing could be made to run absolutely noiselessly, even though the brasses were considerably worn. Another important detail that had led to the success of the modern moderate speed engine was the use of white metal in the bearings, and the author thought it was not too much to say that without the use of white metals the fast running engines of to-day, including marine and locomotive engines, besides those he was considering, would be almost impossible.

Another class of improvements that had or ought to have been adopted was in respect to various fastenings about the engine, and his firm had abolished lock nuts, except on main bearings, and used more secure devices in their stead. With regard to the valves, these might be either of the flat or piston type, the former of which had the advantage of cheapness and steam tightness, but took more power to drive than the piston valve, which was a consideration where automatic expansion by means of a shaft governor was used, as it always should be. The piston form had the advantage of giving good openings in consequence of the length of lip.

Good results could be secured by a valve having steam expanded rings for main pistons. With regard to the steam chest and cylinder cover joints, the best practice was certainly to make them metal to metal, scraped and ground together, and dispense with any more jointing material than boiled oil.

On the question of governing, Mr. Lindley suggested that a shaft governor be used, altering the angular lead and throw of the eccentric so as to vary the cut off and compression, in preference to a governor operating a throttle valve.

In conclusion, the writer observed that as after all the term "high speed" was a relative one, and if it was desirable to attain speeds in the engines corresponding to those usual in the dynamos, why was it that the highest speeds to-day did not exceed 500 revolutions? It was not because dynamos could not be made to run faster than this, as faster speeds were possible; but one reason appeared to be that the centrifugal strain—that is, the momentum of moving parts—increased with the square of the revolutions, which imposed a limit on the speed, as bearings could not be indefinitely increased, while the high speed engine makers had only the same choice of materials as the slow speed engine maker. It was, therefore, not very likely any great increase of speed would be attained in engines of the class considered or where there was rubbing contact. The high speed engine could no doubt be made very economical, if only on account of its high speed and the consequent higher temperature of its cylinder walls; but it was more susceptible to derangement from careless use, and if a breakdown of any part should occur the results were more disastrous than in a slow speed engine. Water in particular was a source of the greatest danger and a separator was therefore usually fitted to this class of engine.

Measurement of High Temperatures.

The *Chemiker Zeitung* gives some extracts from a paper on this subject by Herr L. Holborn and Herr W. Wien (*Wied. Ann. Phys. Chem.*, 1895.-LVI., 360).

There are three methods by which high temperatures may be measured. The first uses an air thermometer of refractory material; the second depends on the change in the resistance of a platinum wire with change in temperature; and the third is based on the employment of a thermocouple of difficultly fusible metals. The air thermometer method was valueless until recently, as suitable vessels could not be made. But now they are produced from some refractory clays, and permit of measurements of temperatures up to 1,500° C. (2,732° F.) The results are, however, vitiated by the effects of capillarity in the interior of the vessel.

The resistance method has some great disadvantages. At high temperatures the absolute resistance generally increases constantly; but the coefficient of the temperature diminishes very irregularly. The presence of free hydrogen also effects the resistance, and the wire must therefore at least be calibrated before and after use. The third or thermopile method has proved the best. The most favorable circuit consists of platinum, and an alloy of platinum with 10 per cent. of rhodium. The increase in the electromotive force of such an element is exactly proportional to the temperature. No substance except carbon affects the constancy of the couple; and temperatures up to 1,600° C. (2,912° F.) can be measured by it.

The Market for Gas Securities.

The mess at Albany is seemingly quite nasty just now, what with the acetylene juggle and the favorable reporting to the Senate of the Sullivan cut-rate bill for New York city. Between these disturbing influences the quotations for city gas shares suffered sharp declines, Consolidated going to a minimum of 148, and although it recovered somewhat, it is still weak and uncertain, to-day (Friday) the bid and asking rates being 149¼ to 150¼. We have no hesitation in saying that it is cheap, for our readers ought to remember that the "favorable reporting" of a bill to the Senate from a committee is quite a way from the signing of the bill by the Governor. All other city gas shares are lower, although Mutual is 225 bid. Brooklyn Union shares are 83½ to 85, and the bonds are 104¼ bid. Chicago gas is absolutely lifeless, but it looks a real good thing at the market, 65 to 65½. Consolidated, of Baltimore, notwithstanding the fusilade of threatened adverse legislation, holds up remarkably well. Consumers, of Jersey City, is strong, at 81 bid, as indeed are all the New Jersey gas shares, which strength largely proceeds from the knowledge that no change will be made this year in the gas laws. Lacledes are strong on the belief that the Supreme Court of the U. S. will render a decision favorable to the Company. The decision ought to be out in a day or two. San Francisco gas has recently scored a sharp advance and is now in good demand, at 81½ to 82. The rise is based on the belief that an agreement has been reached between the Company and the local Edison combination.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

MARCH 23.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,420,000	100	149½	150½
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	205	212
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	225	
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.

Northern	150,000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River..	5,000,000	100	86½	87½
Preferred	2,000,000	100	73	75
Bonds 1st 5's	3,500,000	1,000	98½	100
" 1st Con. 5's	1,500,000	..	86½	88½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	77½	79½
Preferred	5,000,000	100	107½	109½
Bonds, 1st Mortgage, 5's	1,500,000	1,000	109	111
Yonkers	299,650	50	112	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	83½	85
" " Bonds (5's)	15,000,000	1,000	104¾	105¼
Bay State	5,000,000	50	23¾	23¼
" Income Bonds	2,000,000	1,000	..	30
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	..	80
2d " " "	3,000,000	1,000	51½	53½
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	98	..
Chicago Gas Co.	25,000,000	100	65	65¼
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	94	94¼
Columbus	1,000,000	..	..	65
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	81	..
" Bonds	600,000	1,000	101	104
Cincinnati G. & C. Co.	7,000,000	100	208	..
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	41
Bonds (6's)	150,000	..	..	..
Consolidated, Baltimore	1,000,000	100	57	58
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	..	29
" Con. Bonds	4,312,000	..	71½	75
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	79	81
" Bonds	2,000,000	..	90	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	140	145
" Bonds, 6's	2,650,000	..	104½	106
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	85	90
Bonds	1,000,000	1,000	90	94
Louisville	2,570,000	50	..	180
Laclede, St. Louis	7,500,000	100	28	28½
Preferred	2,500,000	100	82	83
Bonds	9,084,400	1,000	..	95
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	98	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	46½	..
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	81½	82
St. Paul Gas Light Co.	1,500,000	100	70	70½
1st Mortgage, 6's	650,000	..	88	90
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	65	68
Bonds, 5's	3,556,000	..	88	90
Wilmington, Del.	500,000	50	188	190

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DIVIDEND NOTICE.

OFFICE OF WELSBACH LIGHT CO.,
DREXEL BUILDING, PHILA., March 11, 1896.

The Directors have this day declared a dividend of twenty (20) per cent., payable on March 24, 1896, to stockholders of record at the close of business March 14. Checks will be mailed. EDWARD C. LEE, Treasurer.

Position Wanted

As Superintendent of Gas Works or Gas and Electric Light Works.

Has been in the employ of the Long Branch (N. J.) Lighting Company as Superintendent for the last 11 years, and is a practical mechanic, thoroughly understanding the laying out and erection of plant and the making of coal and water gas. Best of references. Address CHAS. J. LUTHER,
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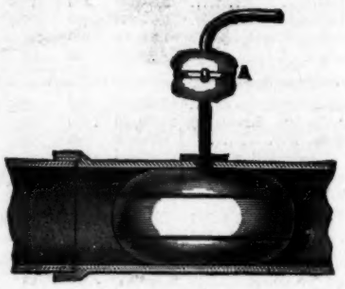

These Gas Bags are used to stop the flow of gas while repairing or making alterations in gas mains. There have been numerous cases of workmen being badly injured, and sometimes fatally, by the escape of gas resulting from the bursting of a bag, and our patent improvement is designed to obviate such calamities. The indicator *A* shows unerringly when the bag has been sufficiently inflated to pack the main, and when the pumping should be stopped. Our Bags are made of a rubber stock especially prepared to admit of great distension, and to resist the action of Oils, Gases, Naphtha and other residuum in the mains, and they are made with lapped joints, which adds greatly to their strength.

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5 " " "	1.05		20 " " "	12.00
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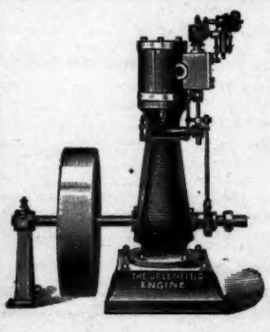

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And the Utilization of Waste Products in Gas Manufacture

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Guaranteed Best Quality.

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COKE CARS for Gas Works,
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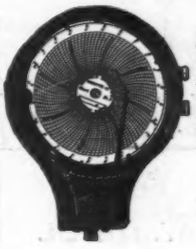
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In the World for Small to Medium Works.

Can be put into Coal Gas Works at a price the interest on which will not be so much as their present repair account.

This Generator is now in use in nearly every State in the Union, and everyone using it will recommend it to you.

It makes a faultless gas from whatever gas-producing materials are cheapest in the locality where required, using hard coal or coke in connection with Lima crude or any other crude petroleum or its distillates, including *Naphtha of any specific gravity.*

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Single Cylinder.

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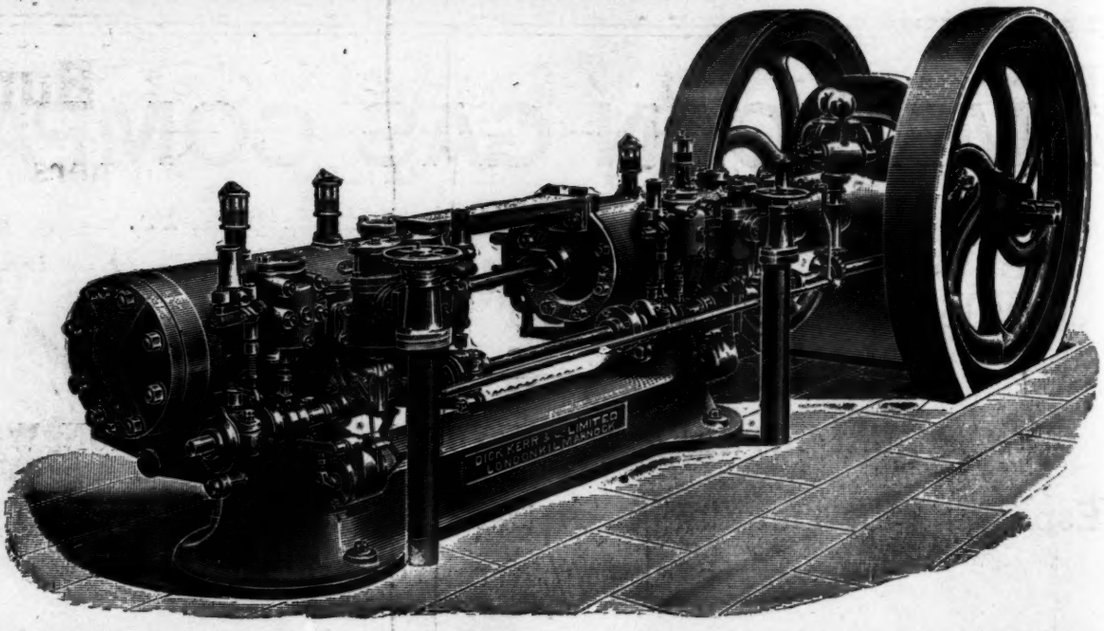

ESSENTIAL PRINCIPLE.—An impulse at each end of piston; using half force to each impulse; doubling the steadiness; reducing the wear on moving parts, and weight for given power. **CONSTRUCTION.**—The piston rod works through stuffing box in front end of cylinder, and connecting rod is carried in a cross-head working in a slide in frame, as in ordinary steam engine practice. All valves are of the poppet type, operated by cams on a single cam-shaft, giving positive movement to every working part. Tube or electric ignition. **RESULT.**—An engine of extreme simplicity and steadiness of action, the even wear on the cylinder and all working parts assuring increased economy, long life, and minimum cost in repairs. **RECORD.**—Successful and constant use in Great Britain for the past eight years. Address

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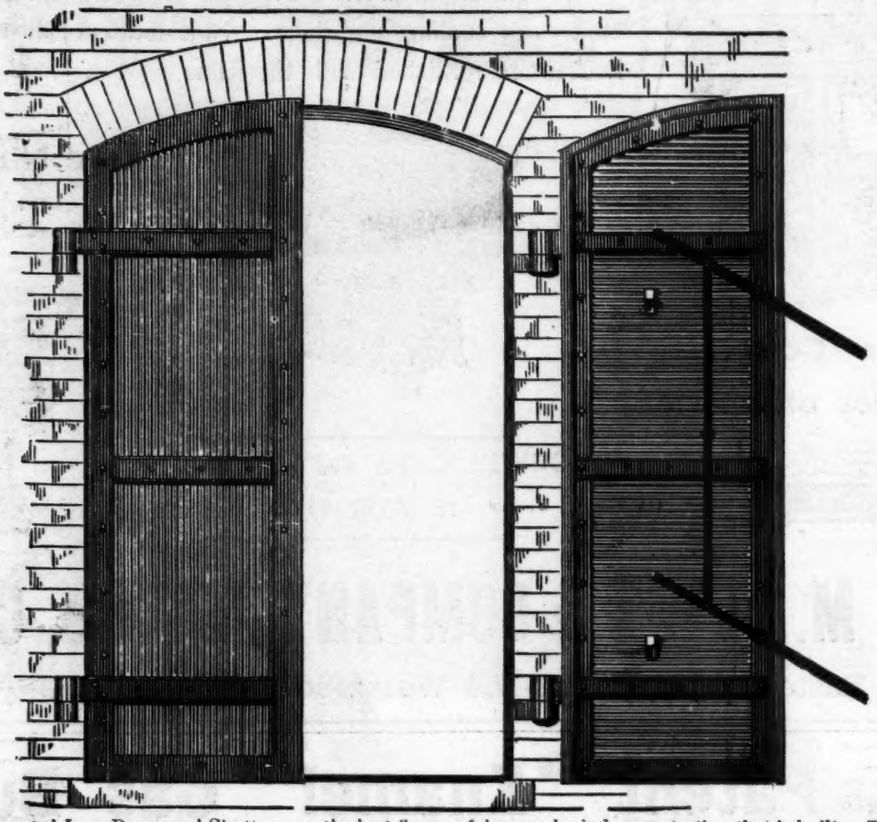

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NEW YORK AND PHILADELPHIA,

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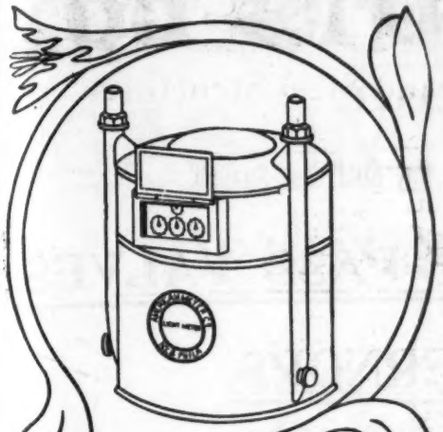
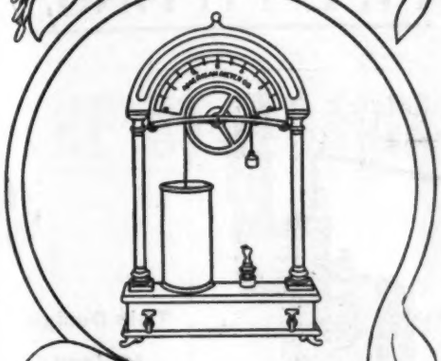
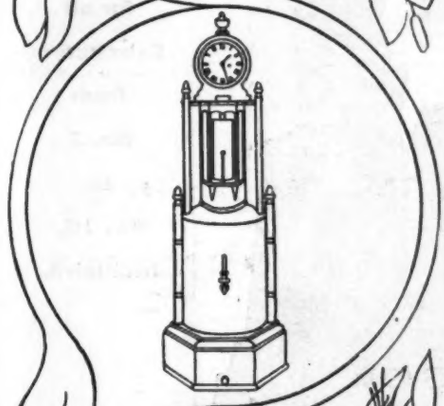






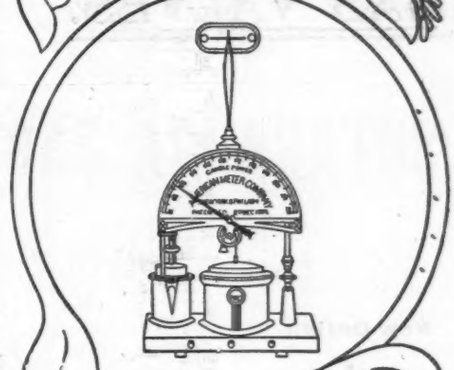
PUBLIC LIGHTING TABLE.

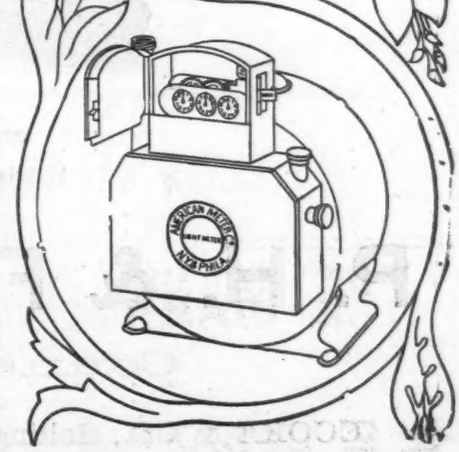
APRIL, 1896.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Wed.	1	6.50 PM	12.10 AM	6.10	4.55
Thu.	2	6.50	1.20	6.15	4.40
Fri.	3	6.50	2.20	6.15	4.40
Sat.	4	6.50 LQ	3.00	6.15	4.40
Sun.	5	7.00	3.40	6.15	4.40
Mon.	6	7.00	4.10	6.15	4.40
Tue.	7	7.00	4.30	6.15	4.40
Wed	8	7.00	4.30	6.15	4.40
Thu.	9	7.00	4.30	6.25	4.30
Fri.	10	7.00	4.30	6.25	4.30
Sat.	11	7.00	4.30	6.25	4.30
Sun.	12	7.10 NM	4.20	6.25	4.30
Mon.	13	7.10	4.20	6.25	4.30
Tue.	14	7.10	4.20	6.25	4.30
Wed	15	7.10	4.20	6.25	4.30
Thu.	16	7.10	4.20	6.30	4.20
Fri.	17	10.40	4.20	6.30	4.20
Sat.	18	11.30	4.20	6.30	4.20
Sun.	19	12.10 AM	4.10	6.30	4.20
Mon.	20	12.50 FQ	4.10	6.30	4.20
Tue.	21	1.20	4.10	6.30	4.20
Wed.	22	1.50	4.10	6.30	4.20
Thu.	23	2.20	4.10	6.40	4.10
Fri.	24	2.50	4.10	6.40	4.10
Sat.	25	3.10	4.10	6.40	4.10
Sun.	26	No L.	No L.	6.40	4.10
Mon.	27	No L. FM	No L.	6.40	4.10
Tue.	28	No L.	No L.	6.40	4.10
Wed.	29	7.20 PM	11.00 PM	6.40	4.10
Thu.	30	7.20	12.00	6.45	4.00

TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs. Min	By Table No. 2.	Hrs. Min.
January	220.40	January	423.20
February	207.00	February	367.40
March	193.00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142.10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00





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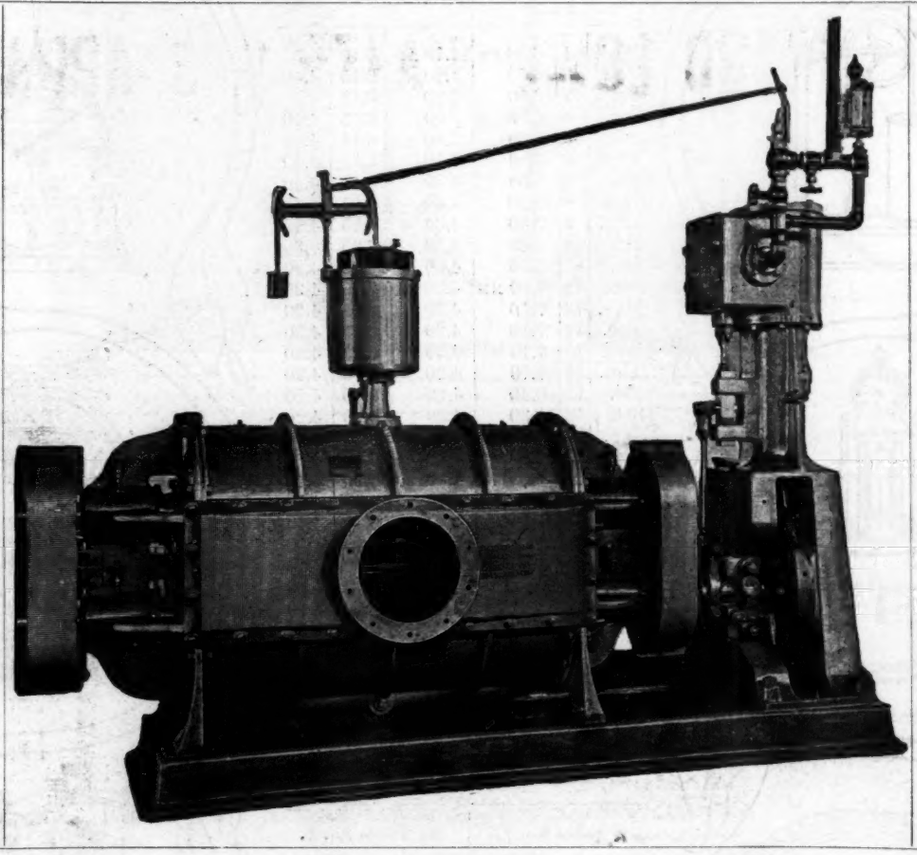

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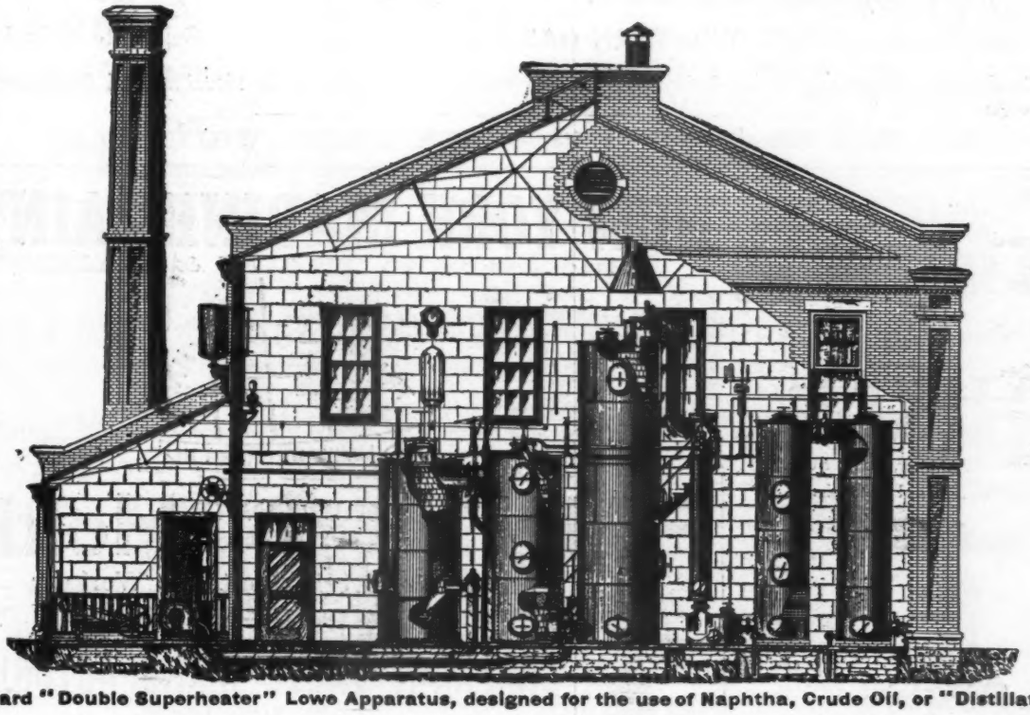

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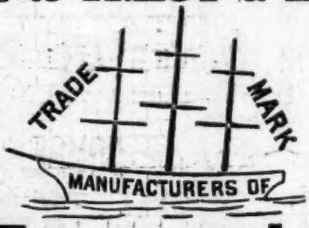

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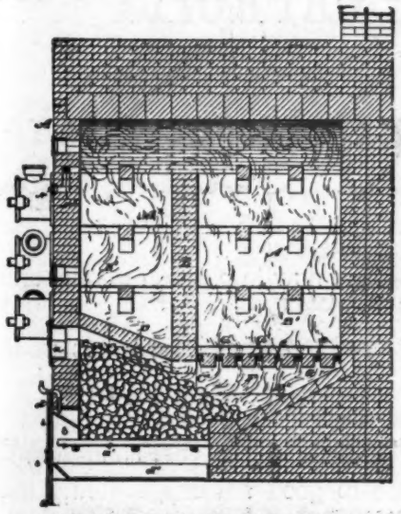

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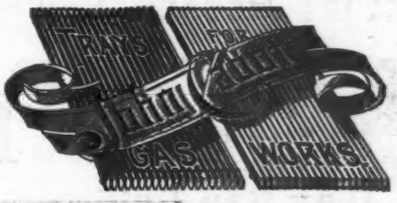

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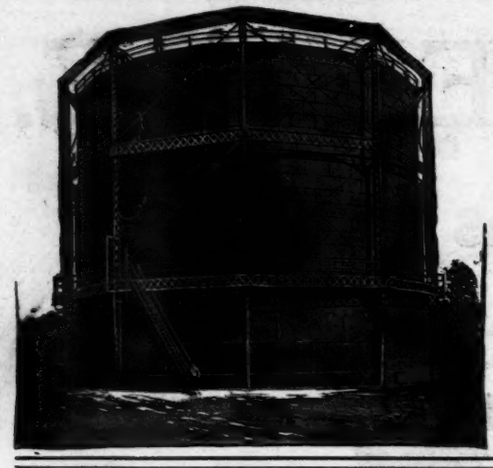

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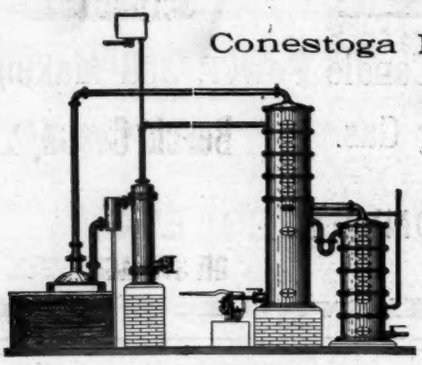

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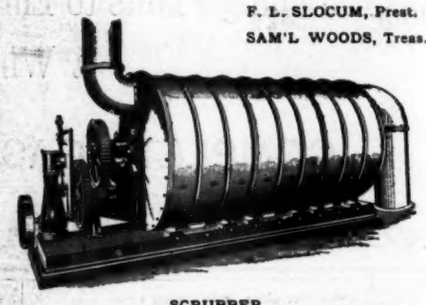

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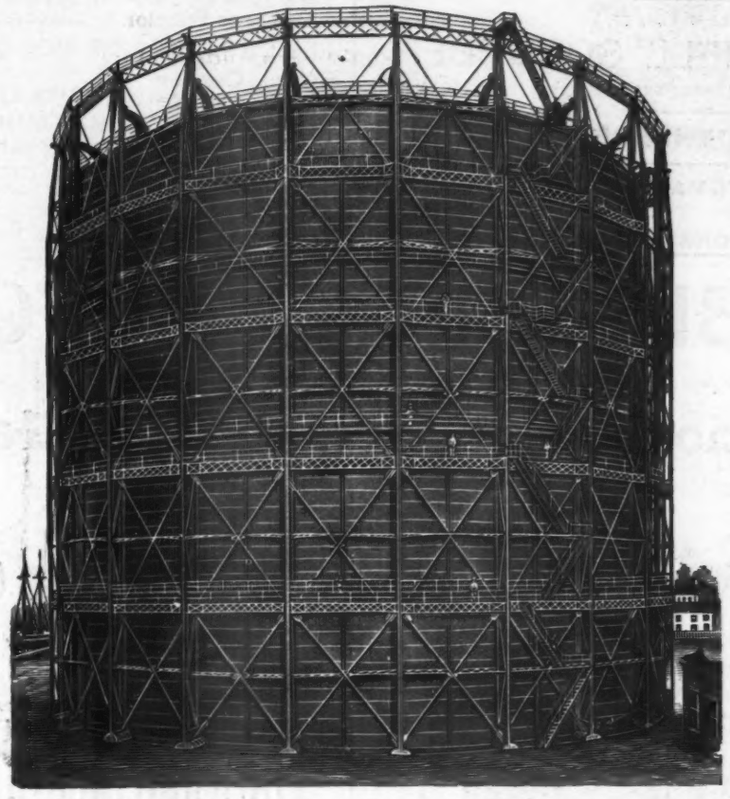

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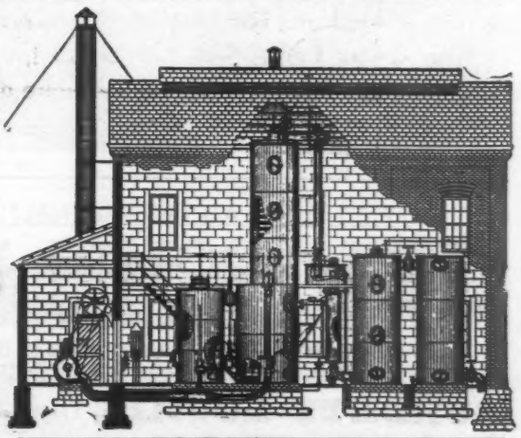

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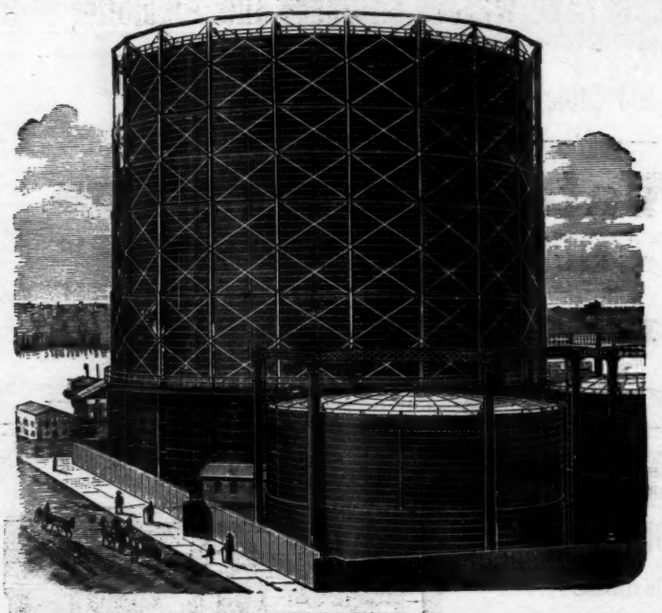

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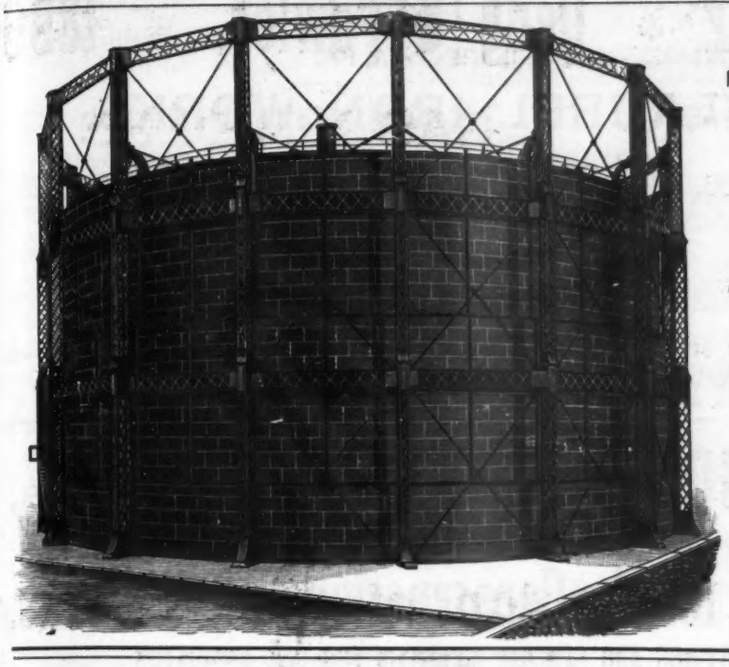

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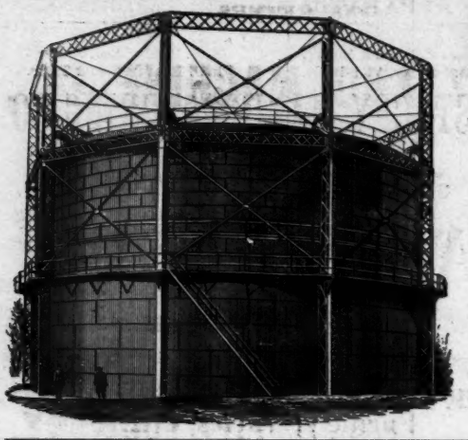

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